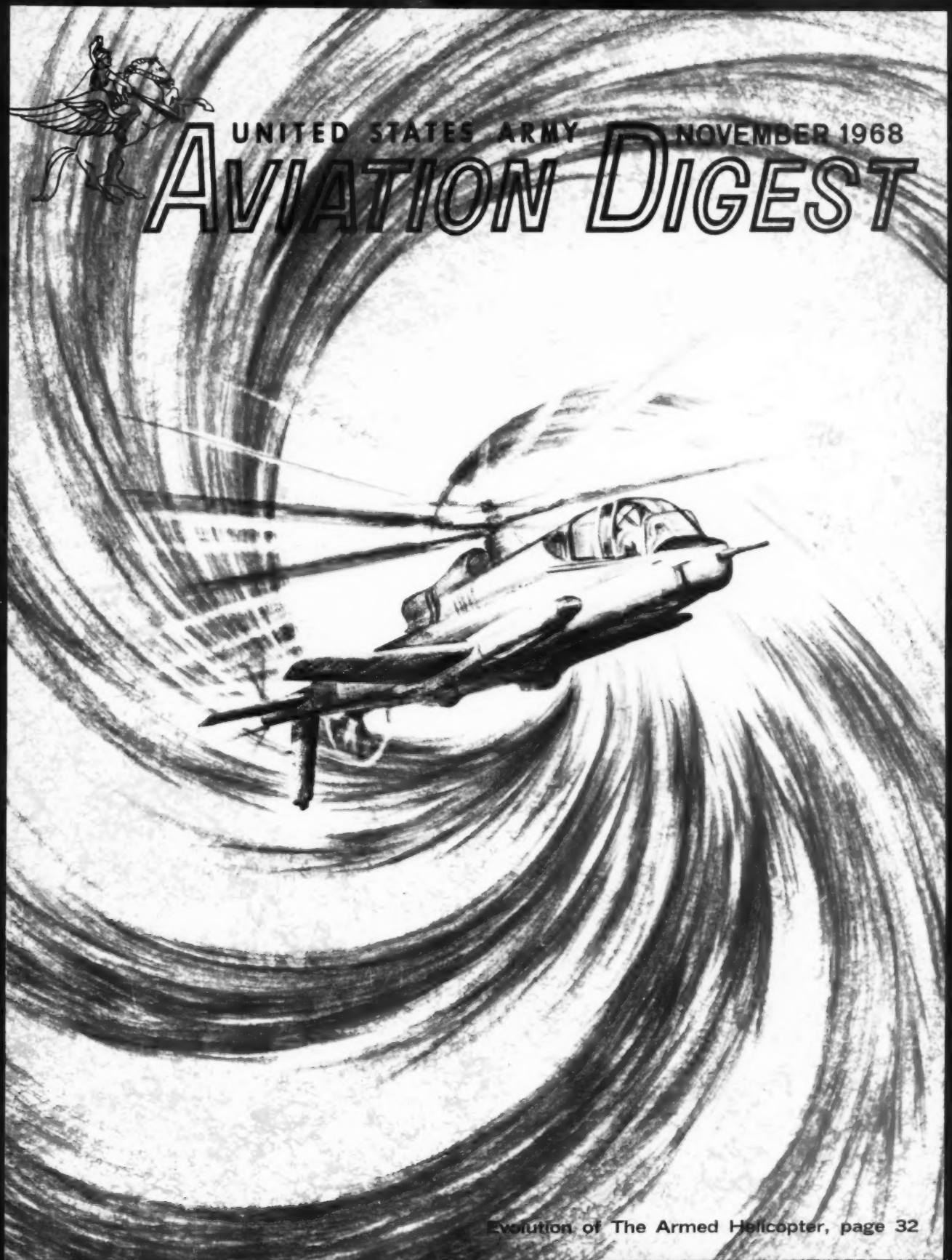
UNITED STATES ARMY
NOVEMBER 1968
AVIATION DIGEST
Evolution of The Armed Helicopter, page 32

UNITED STATES ARMY AVIATION DIGEST

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The mission of the U. S. ARMY AVIATION DIGEST is to provide information of an operational or functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, aviation medicine, and other related data.

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Articles, photos, and items of interest on Army aviation are invited. Direct communication is authorized to: Editor, U. S. Army Aviation Digest, Fort Rucker, Ala. 36360.

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VIEWS FROM READERS

The DIGEST received the following from the Office of the Assistant Chief of Staff for Force Development, HQ, Department of the Army, concerning redesignation of units:

On 17 August 1968, the Chief of Staff, United States Army made the decision to redesignate the 101st Air Cavalry Division and the 1st Air Cavalry Division as the 101st Airborne Division (Airmobile) and the 1st Cavalry Division (Airmobile) respectively. His decision also provided that divisions organized under this concept in the future would retain their then current designation with airmobile shown parenthetically.

As background information, the following rationale was used by the Chief of Staff, United States Army in arriving at his decision:

It is being done to preserve the historic significance and traditions of these two famous old divisions — 1st Cavalry Division and 101st Airborne Division. They are both airmobile divisions organized under identical TOEs. This fact and the type of organization will be recognized by the "Airmobile" suffix. The 1st Cavalry Division has been since its commitment in Vietnam informally and unofficially known as the 1st Air Cavalry Division. This will continue to be recognized informally although the official designation will be the 1st Cavalry Division (Airmobile). Going back to the original designations preserves the long established esprit connected with these famous old outfits, one Cavalry and one essentially Light Infantry. Both organizations, i.e., Cavalry and Light Infantry, because of their background, type mission, agility, mobility of mind and spirit, and flexibility, are particularly suited to undertake the airmobile role. Units assigned to the Division, for example battalions of certain regiments, will keep their old designation, simply adding the suffix "Airmobile."

Sir:

I am interested in attending the CH-54 transitioning course at the U. S. Army Aviation School at Fort Rucker.

I am refering to the article in the February 1968 issue of Aviation Digest ["Transitioning Into The CH-54," page 2].

I have not been able to get any other information on the school. Could you direct me on who I could write to and attain the complete information and if direct communication is authorized.

CW2 Larry G. Hatch
66th Aviation Company (Corps)
APO New York 09079

• Prerequisites for the CH-54 Pilot Course as prescribed in the CONARC Program of Instruction and DA Pam 350-10 are: "Commissioned officer or warrant officer member of Active Army who is assigned or under orders to a unit equipped with CH-54 helicopters must hold a currently effective aviator designation, be qualified as a rotary wing aviator (1981) or helicopter pilot (062) and possess a current Army rotary wing instrument card (tactical, standard, or special). He must be turbine-engined qualified and have a minimum of 500 hours rotary wing time (pilot and/or instructor) of which 250 hours must have been flown as pilot or instructor pilot in utility or cargo helicopters. No security clearance is required. Obligated service for Active Army commissioned or warrant officers is one year."

Application to attend the course would be accomplished in the same manner as for any other course. Many individuals have accomplished this by contacting their respective branch.

— The Editors

Sir:

The article "Filters, Screens and Strainers." June 68 DIGEST was excellent. The importance of a proper functioning filtration system can't be overemphasized.

The picture (page 48) shows another source of contamination. The protective caps for the fuel filter are shown laying on the ramp with the open end facing down. On their next use the accumulated contaminants will be forced into the aircraft.

MAJ John T. Snodgrass, Jr.
HQ, 35th Signal Group
Ft Bragg, N. C. 28307

• Major Snodgrass is correct. Kudos to his sharp eyes. — The Editors

The DIGEST received the following letter from MAJ Richard H. Hummel, 195th Assault Helicopter Company (UH-1) (A), 214th Combat Aviation Battalion, APO San Francisco 96384:

Sir:

The following is inscribed on every aviator's farewell plaque which is presented to members of the 195th Assault Helicopter Company (UH-1) (A), 1st Aviation Brigade, APO San Francisco 96384, prior to their DEROS from Vietnam. It has been written to distinguish primarily the unique traits of a dedicated Army helicopter combat pilot. However, it also is intended to be a tribute to all Army aviators as well.

I am submitting the inscription to your office for possible future publication in the U. S. Army Aviation Digest. The author is CPT Gregg S. Bond, Infantry, OF 106 505, former airlift platoon commander, flight operations officer, and currently the executive officer of this unit.

★ ★ ★

I have flown through the fiery gates of hell
And hovered at Satan's door;
I have answered his call from every height
With all the fire I could pour.

I have sensed the fears of combat
Yet I have never refused to fly
In support of my fighting comrades
Who without me were destined to die.

Now my destiny has been written
In the burning eternal sun
I will forever be an Army Aviator
Who in combat was surpassed by none.

Highway Mission—Airmobile Style

Colonel Kenneth D. Mertel

LEFT HALF 6[1], en route from home base at An Khe by command helicopter (UH-1D) to the brigade forward command post, near Pleiku, mused over the rush order and reason for his flight. A call the previous evening directed him to report to the brigade commander at first light. What could be the rush? The battalion had closed into An Khe the previous day to assume base security and obtain a bit of rest after rigorous combat actions in the Battle of the Ia Drang[2]. There must be another change of mission, or orders, as the battalion had expected to remain at An Khe for seven days.

On landing at the stadium a few minutes later, the brigade commander provided reasons for the early flight. The Battle of the Ia Drang would continue. Additional logistics were required. Highway 19 was to be opened from An Khe to Pleiku to provide for the movement of supplies. The highway was already open from Quin Nhon, the China Sea Coast end of the supply terminus, to An Khe. This would complete the route on to Pleiku, another eighty kilometers. The battalion would have the job of opening and securing a major portion of the highway for a period of ten days with minimum assets, escorting supply convoys and destroying enemy within striking distance of the highway.

Battalion attachments for this mission were limited and would include two platoons of UH-1D (8 helicopters), two CH-47s (Chinooks), supporting aerial rocket artillery (ARA), one battery 105 mm artillery (howitzer), one battery 8 inch artillery (howitzer), one battery 175 mm artillery (gun, supporting from Pleiku), one battery 155 artillery (howitzers, supporting from An Khe), one platoon of engineers, two White teams (Scout) from the Air Cavalry Squadron (OH-13s, two to a team), one Red team (weapons) also from the Air Cavalry Squadron (two UH-1Bs).

Upon receipt of the order, Left Half 6 remained a few minutes longer with the brigade commander to discuss further details of the operation. Meantime, the S-3 artillery liaison officer (Arty LO), and Air Force liaison officer (ALO), who had accompanied the battalion commander, contacted their opposite numbers on the brigade staff for additional information and to place further requirements on the brigade, needed in support of the highway security mission.

Thirty minutes later, the battalion command party was airborne en route to An Khe. A quick radio call from Left Half 6 to the executive officer at An Khe, using the prearranged battalion operation code, alerted the battalion for the new mission. Since the operation would begin the following day, there was little time for preparations.

Upon arrival at An Khe, Left Half 6 reviewed with the staff the essentials of the mission and gave his preliminary guidance to start them on their portions of the operations order to be issued that afternoon.

Next, Left Half 6 with the S-3, Arty LO, ALO, flight leader of supporting UH-1D helicopters, and engineer platoon leader embarked on a helicopter reconnaissance of Highway 19 from the An Khe terminus to a linkup point with South Vietnamese forces near Pleiku. The reconnaissance party was especially alert for selection of critical terrain features to include hilltop positions clearly dominating the road. Bridge sites were spotted, especially those which would be difficult in preparing a bypass if the bridge were blown. Tentative artillery fire bases were designated to provide continuous tube artillery support over the entire highway. The command party was especially observant for potential Viet Cong (VC) ambush sites, where a few VC at a critical portion of the routing could cause maximum damage to a convoy with minimum forces.

Left Half 6 recalled from reading "Street Without Joy" how French Task Force Group Mobile 100 was ambushed along this same road, between An Khe and Pleiku. This historical event was well marked on the highway by a monument commemorating those dead of Group Mobile 100. How different

[1]Code name for the commanding officer, 1st Battalion, Airborne, 8th Cavalry.

[2]First major campaign, October - November 1965, 1st Air Cavalry Division against a North Vietnamese Army (NVA) Division, vicinity Pleiku/ Plei Mei, Central Highlands, South Vietnam.

Lieutenant General Robert H. York in a June 1967 AVIATION DIGEST article stated, "In Southeast Asia this bold new concept [Army airmobility] has opened a dimension in warfare that is perhaps the greatest tactical innovation since the German blitzkrieg of World War II." The full impact of General York's statement hits when one compares the situation faced by France's Group Mobile 100 a decade ago on Highway 19 in Vietnam with the airmobility offered by Army helicopters as described here. It is like comparing the 12th century crusades with the campaigns of World War II.

Group Mobile 100, an elite combat unit, was decimated within a few months because of the unique and trying conditions of Vietnam. A mere 15 miles may as well have been 1,000 when one considers the dense forestation and an enemy that knew its key to victory was to lure the French deep into the jungles and then cut off all escape routes — a tactic the Viet Minh executed all too well. However, Army aviation adds a new dimension. To feel the impact one needs only to compare today's action in Vietnam with that of the proud unit that carried France's colors well in Korea, but was unable to cope with the Viet Minh.

The Battle of the Ia Drang would continue, and Highway 19 (left) was to be opened . . .

the situation for the French, had they possessed our airmobility. Air assault techniques with their marked advantages in movement, firepower, command and control, intelligence and reconnaissance and logistics could have spelled success for the French.

Reconnaissance was completed and the command party returned to the battalion base where the final operations order was completed. The battalion order was issued with the company commander supporting commanders, and the battalion staff present. Basically, the plan provided for stationing airmobile forces on critical terrain features and bridge sites. The entire area was to be covered by tube artillery support from artillery positions on preselected critical terrain features. Air Cavalry units and patrols would search enemy avenues of approach.

An efficient radio communications system was developed to tie in all critical combat elements and artillery. Tactical airpower would be on Air Cap, particularly when convoys were en route. Convoys would be escorted employing the battalion antitank platoon elements in four ¼-ton trucks, each armed with a 106 recoilless rifle and .50 caliber machinegun. The plan called for the three rifle companies to be employed, each assigned a sector. Delta company (Combat Support Company) acted as a "thunderbolt" or reserve force, employing the reconnaissance platoon and remainder of the antitank platoon not required for the escort mission.

Upon completion of the battalion order, Left Half 6 took the company commanders on an aerial reconnaissance of the highway. He pointed out their sectors, critical terrain features and bridge sites directed for occupation by troops, positions where the artillery would be emplaced and specific enemy avenues of approach. At the same time they all discussed the SOP that would be used and identified certain terrain features with code words to simplify future discussions of those terrain features over the radio. The flight pattern during the reconnaissance in the command helicopter was conducted so as not to divulge specific intentions of the unit. It was to appear to be one of the many daily flights to and from An Khe to Pleiku.

After his return and completion of detailed plans, the company commander issued orders. Equipment was checked, supplies issued, and the battalion prepared for the initial move out the following morning.

Execution of the airmobile plan specified initial occupation of critical terrain features at first light, without clearing all of the highway. Employing two platoons of UH-1D helicopters, B Company secured the eastern one-third of the highway from An Khe to Pleiku. Two platoon positions with nearby bridges plus two additional bridge sites were to be held. A battery of 105 mm tube artillery was emplaced in the most westerly platoon position.

The move was completed without incident, followed in quick

. . . and secured an additional eighty kilometers from An Khe (right) to Pleiku

succession by the rapid air assault of C Company to secure the next middle third of the highway and A Company to secure the western portion. Company A and C areas included one critical terrain feature each, to be occupied by at least a rifle platoon. The farthest unit to the west, C Company, included a battery of 8-inch howitzers, self-propelled, moved later into position by highway.

As soon as the artillery position in A Company area was cleared and secured by a platoon of infantry, Chinooks began movement of the battery by air to occupy the position. As the area was secured westward and under cover of emplaced tube artillery, the engineer platoon began a detailed road reconnaissance of the highway to include a mine check of any suspicious areas, including bridges. The engineers were followed by a self-propelled 8-inch howitzer battery, which joined C Company.

As the air assaults continued under escort by UH-1B helicopter gunships and protected by an Air Cap of two A-1Es overhead, the air cavalry teams were busy. Two White teams, each covered roughly one-half the battalion sector, patrolled both sides of the highway for five kilometers, searching for any sign of enemy activity. The Red team remained generally in the central portion of the battalion sector, ready to reinforce the White teams as required.

The antitank platoon with its four gun-jeeps accompanied the engineers to familiarize themselves with the road, prepared to provide escort for the initial convoy to be dispatched that afternoon.

Each rifle company organized platoon positions with as large a company reserve as possible. All three 81 mm mortars were positioned at a central location within each company sector. Fire of all three mortars could cover the most critical portions of the unit area. Delta Company mortars, the four-gun platoon, were positioned in the center company (Company C) to lend support to either the east or west.

The reconnaissance platoon with the remainder of the antitank platoon were positioned at the battalion forward CP, established on a high mountain range at Mang Yang Pass, in the vicinity of the 8-inch howitzer battery. Here helicopters would lagger[3] with the battalion reserve, prepared for employment as a thunderbolt or reserve force anywhere within the battalion sector. The maximum time distance was 10 minutes, 30 kilometers away.

The Arty LO carefully coordinated a program of mortar and artillery harrassing and interdiction (H&I) fires for the first night, extending five kilometers on either side of the road. A careful check was made to keep Vietnamese civilians out of the area, especially near critical bridge sites. One or two sites on the eastern end were near population centers.

[3]Lagger: tactical assembly area where airmobile infantry and assault helicopters are joined for immediate tactical employment.

The 1st Air Cavalry Division had been requested to advise all air traffic flying between An Khe and Pleiku to proceed up and down the highway, within two or three kilometers of the highway and to search the terrain for anything suspicious. Indications of enemy activity of any sort were to be reported by a radio call over the proper frequency to Left Half 6 who would alert elements of the battalion to further check that area. Thus, many aerial eyes were observing the highway, since normally air traffic was relatively heavy between An Khe and Pleiku.

By midday all three rifle companies were in position. The air assault had been completed without opposition. The first convoy reported at 1300 hours and consisted of 120 vehicles. They were to proceed from An Khe to Pleiku in a continuous stream. The lead vehicle was escorted by one of the antitank platoon gun-jeeps, with one jeep trailing at the end and the other two spread throughout the column. The escort provided warning and enemy attack so that battalion firepower and the thunderbolt force could be employed immediately. Before convoy release, the engineers and the mounted portion of the antitank platoon had thoroughly checked the highway for mines.

During the movement of the convoy, Left Half 6 remained airborne in the command helicopter. He could observe movement of the convoy, foresee bottlenecks, and prepare to employ combat power if the enemy situation required. A number of five-ton wreckers were

Chinooks moved the battery into position by air (left) . . . and by midday the rifle companies (right) had moved into position

under battalion control to proceed to the locations of any disabled vehicles to expedite their movement. The air cavalry teams continued screening and reporting.

Part of the battalion plans included a habitual resupply of deployed units. This was usually accomplished late in the afternoon, normally employing one UH-1D helicopter per rifle company. Preparations were also made to provide medical evacuation.

This was the sequence for the first day. The convoy completed movement to Pleiku by nightfall without enemy opposition. The battalion continued with plans and made preparations for the night, maintained security on the critical terrain features, and prepared for escort duties the following morning. The engineers and antitank platoon, accompanied by White team scouts, would thoroughly check the road the following morning to ascertain if mines had been emplaced either on the road or bridges, or to detect possible ambushes established during the night.

A similar sequence continued for ten days with only minor interference by snipers. No real attempt was made by the enemy to ambush convoys on the highway. Yet it was a long sector; the battalion was responsible for over 60 kilometers of highway. This extensive sector was held with three rifle companies and a combat support company. Limited reinforcements were available to the battalion, yet the mission was accomplished successfully. Had there been an enemy attack of any proportion it would have been met with devastating firepower and maneuver.

Why was this battalion successful? Primarily because of the mobility inherent in an airmobile force. Its rapid reaction was a vital factor — the ability to spread forces quickly over an extensive distance, occupy critical terrain features easily from the air, surprising the enemy. Second, of major importance was the use of firepower, to include tube artillery, tactical airpower, aerial rocket artillery, gunships, and mortars as well as other organic weapons. Third, many eyes of the White and Red teams as well as other aircraft flying back and forth between An Khe and Pleiku assured superior detailed observation. Last but not least was excellent command and control provided by the communications system and command helicopter plus correct functioning of the battalion command post midway within the sixty kilometer area. The battalion was able to operate as an economy of force unit, carry out the difficult mission with its limited forces in support of the remaining part of the Battle of the Ia Drang.

One cannot help but realize how different history might have been for Group Mobile 100 in 1954 had it possessed the mobility, firepower, and command and control inherent within one airmobile infantry battalion. The Viet Minh would not have been the victors.

Systems Engineering and Army Aviation

Uniform procedures are redesigning certain new courses and redesigning old courses in the Army training program

Major W. H. Gardner

LAST FEBRUARY, CONARC published a new regulation which will have a significant impact on Army aviation training and training bases. CONARC Regulation 350-100-1, Systems Engineering of Training (Course Design), establishes uniform procedures for designing new MOS producing and functional courses, and redesigning existing MOS producing and functional courses and Army Subject Schedules conducted or prepared by USCONARC service schools and training centers.

The Army aviation training program has some 51 existing courses (19 of which are MOS producers) affected and another 19 in the planning stages. These courses range in length and complexity from the 9-month initial entry rotary and fixed wing aviator courses to 3-week transition courses. Only orientation courses, 2 weeks or less in duration, are exempt from being "systems engineered." As stated, although lowest in priority, Army Aviation Subject Schedules also fall within the purview of this regulation. The priorities for systems engineering of courses are as follows:

High attrition courses (over 10%) — Example: Initial entry rotary wing aviator courses (WORWAC/ORWAC).

High density courses — Example: Aircraft Maintenance (Entry) Course, MOS 67A10.

Other MOS producing courses — Example: Examiner courses, multi-engine qualification courses (FW or RW) for warrant officers.

Functional courses — Example: Helicopter Instrument Flight Course.

Other courses and Army Subject Schedule — Example: Army Aviation Medicine (Basic) Course.

The effective date of the regulation is 1 April 1968, and it states that systems engineering of all existing courses may well take up to five years to complete. All new courses and Army Subject Schedules are to be designed following the procedures detailed in this regulation.

Systems engineering of training, is not new to the Army, nor to other members of the armed services. Studies conducted by the Army with various universities some years ago pointed up the advantages gained by this approach when applied to training. Also much of the Air Force training today has been systems engineered, although perhaps not in the manner as described in Army Regulations.

HumRRO has conducted numerous studies which have indicated the value of the systems engineering approach to training. These studies demonstrated that great savings in manpower and money could be realized by streamlining courses to the point where only that required to be taught was being taught and only to the extent necessary.

What is systems engineering of training? The regulation defines it as "That series of orderly, systematic steps designed to produce a course of instruction that will provide graduates with skills and knowledge essential to perform at the entry level in his MOS."

CONARC Regulation 350-100-1 discusses seven processes, to be accomplished in sequence, that make up systems engineering of training: job analysis, selecting tasks for school learning, training analysis, developing training materials, developing testing materials, conduct of training, and quality control.

Job analysis consists of two operations: identifying the job, and developing the task inventory. When the purpose of the job analysis is to analyze an existing job, the sequence is to identify the job and then develop the task inventory. When the purpose is to develop new Army jobs, the sequence is reversed. Several elements of information must be obtained and recorded for use when developing the task inventory, such as: job structure; duty position; units and organizations assigned; related units, organizations and MOS; major job requirements; work environment; assistance available; and equipment to be used.

The task inventory itself may be prepared in either a matrix format or as a list. The matrix is easier to prepare but more difficult to analyze and the reverse is true for an inventory list. For many of our aviation MOSs the number of tasks that the individual must accomplish may well run into the thousands. The task inventory must then be validated for existing jobs through the OPO data bank or local feedback channels.

Based on validation information,

the second step consists of determining which tasks should be taught in formal school courses. Those tasks not selected for school training must be selected for training elsewhere or specified as prerequisites. A trainee has already learned to perform certain tasks. He may learn them in a course of training or on the job. The regulation prescribes the major considerations in identifying tasks most essential for school training which includes, where applicable, Army Training Programs and Army Subject Schedules. It must be recognized that the selection of tasks for other than formal schooling at aviation schools will involve considerable coordination and/or the preparation of materials to assist in on the job training.

The third step, training analysis, which is outlined in considerable detail, bridges the gap between selecting tasks for school training and developing training materials and test instruments. Four operations are involved:

- Identifying the job conditions, standards, supporting skills, knowledges, and attitudes, using what the regulation calls a Job Task Data Card.
- Converting job requirements to training objectives and criteria. Tasks and subtasks recommended for training, their associated conditions and standards, the supporting skills and knowledges, and the significant attitudes are converted to training objectives using a format entitled a Training Analysis Information Sheet. The preparation of training objectives is the critical step in the development cycle as it determines the content of the training program. Where the systems engineer may have begun with a thousand tasks, he has now prepared possibly five times that number of Training Analysis Information Sheets.
- Developing the course structure. The Training Analysis Information Sheets (training objectives) are arranged in their most logical order for instructional purposes. This is done in three steps: sorting training objectives into closely related groupings, sequencing the training objectives within these groupings, and sequencing the groupings into an overall course structure.
- Developing a course evaluation concept. Decisions are made regarding the most appropriate points within the course structure to evaluate student achievement, using what the regulation prescribes as an Evaluation Planning Information Sheet.

The next two steps are performed concurrently. Considering each in turn, the developing of training materials consists of taking the sequenced training objectives and the overall course structure, and preparing instructional materials and aids, including handouts, training aids, lesson plans, and finally POIs. As it is in this step that the actual time required to perform the various training objectives is determined, lesson plans are developed ahead of the POIs.

In this step the decision can be made as to whether part or all of the particular course is suitable for programmed instruction. It is in this step that such factors as the characteristics and capabilities of students, instructors available, and resources obtainable (facilities, materials, equipment, simulators, training methods, and training media) are considered for the first time.

The fifth step, developing testing materials, specifically deals with test construction and the preparation of test outlines, standards, and instruments. With the finalization of the test instruments, the POI for a particular course can now be completed and sent to CONARC for approval.

The sixth step in the systems engineering process (the conduct of training) is not covered in the regulation. FM 21-6 is referenced.

Quality control, the last step, is the trial and evaluation of the instructional system. It is a continual empirically-based process of analyzing various feedback information and adjusting the instructional system. The feedback information will either be external or internal in nature.

External feedback includes such areas as Vietnam lessons learned, interviews with aviators, and more current information from the OPO data bank. Internal feedback would involve test score analysis and course critiques. Internal feedback will affect the conduct of a course and external feedback will affect the content of the course. Success of the systems engineering approach depends on the collation and validation of continuous feedback and its application at the appropriate step in the overall process.

Briefly, it can be seen from the above that the Army aviation training bases have a monumental job ahead of them to implement this regulation over the next five years. Overall responsibility has been given to the Curriculum Division, Office of the Director of Instruction, USAAVNS, Fort Rucker, but the impact of CONARC Regulation 350-100-1 will be felt throughout all Army aviation schools. At first, the initial entry rotary wing course and one of the seven ATC courses planned for FY 70 will be systems engineered. By breaking out at intervals the expertise gained in these areas, by late 1969 all courses will have begun the systems engineering process.

The systems engineering approach to training throughout Army aviation will result in courses, geared specifically to the needs in the field, that will be taught as professionally as possible in the shortest practical time.

Chatterbox

CW2 Billy J. Allen

HOW OFTEN have you gone through a lengthy period of instructing, with both the UHF and fox mike radios chattering full blast in your ears about everything from a dissertation on cockpit procedure to what someone had for dinner last night? This can be very annoying and tiresome, especially in the early stages of a new training cycle, when a considerable amount of discourse over the intercom is necessary in addition to monitoring the radios for information pertinent to the conduct of safe flying.

Let's examine what effect excessive or lengthy transmissions have on the safety of flight. For obvious reasons, it is mandatory that you monitor the frequency of the stagefield or facility at which you are working. If an excessive amount of chatter is present over the radios, there is a natural tendency to turn the volume down, since it becomes very difficult to impart word of wisdom with distracting chatter assaulting your ears. This may cause you to miss pertinent transmissions, for it is difficult to discern these from the remaining chatter.

From another viewpoint, suppose you are working the local area and monitoring the appropriate stagefield frequency, and you experience a flame-out. You attempt to notify the stagefield of this fact, plus give them your location. From 700 feet AGL in the UH-1B, assuming a normal autorotative descent of 1,200 to 1,500 feet per minute, you have approximately 30 to 40 seconds before ground contact is made. How often have you heard this time far exceeded by some student inadvertently broadcasting an epilogue on cockpit procedure, or some instructor discussing a problem that could have been delayed until he was on the ground?

Also consider mandatory transmissions at the stagefield or facility, such as turning base for a low level autorotation or entering and departing traffic. These transmissions not only inform the tower of your intentions, but other aircraft in proximity as well, permitting them to plan accordingly. Yet more often than necessary, so much chatter exists as to preclude these transmissions until they are either worthless, or much reduced in effectiveness.

The whole point is that much too often, really unnecessary chatter prevents transmissions which are not only mandatory, but necessary for the safe operation of so many aircraft in close proximity to each other.

The great majority of chatter, or unnecessary radio transmissions, can be divided into two general classes, those made intentionally, and those made with the selector switch inadvertently left in the transmit position, and the floor mike switch is used to talk over the intercom.

Let's consider the first group of transmissions, including those made intentionally which are either excessive in length or completely unnecessary. Many of these transmissions could best be eliminated and the information passed on after landing. Yet many more could be eliminated completely, among those being the usual half dozen responses when someone heedlessly makes a transmission. I am sure we have all been guilty of this at one time or another.

Perhaps the best way to reduce unnecessary chatter is to shorten the length of the transmission itself. It should be concise, and to the point. First think about what you intend to say, then make your transmission. This will not only reduce repeats caused by errors, but it will also reduce the total transmission time considerably. A call need only specify who you are, where you are, and your intentions. Let me reiterate, be concise.

Now consider the second, sometimes humorous, group of transmissions, those made unintentionally and those made intentionally, but on an incorrect frequency. Sometimes they are on the correct frequency, making a legitimate call, but are suddenly distracted by some minor crisis, usually precipitated by the student.

I recall just such a case. The instructor cut the throttle, giving his student a forced landing on east downwind at Hooper. He made the required call, "Hooper, six-one-three-four simulated east . . ." at which point as very choice hyphenated expletive was heard very loud, then silence. One often wonders about the thoughts left unexpressed in such situations. Recently, I overheard an emergency in progress at Cairns. A UH-1 had called in for an emergency landing with complete tail rotor failure and severe vibrations. He was cleared by the tower to take the current active for a running landing. As he stopped sliding, the tower operator asked him to expedite in clearing the active. There was silence on the radio, but you may rest assured there were plenty of thoughts begging to be expressed. Perhaps

we should give the gentleman an "A" in composure.

Recently an aircraft working the local area inadvertently transmitted the following conversation between its occupants: "Man alive! Look at that red bathing suit. WOW! There are two of them. Let's take a closer look." Then came the usual response from other aircraft wanting the exact location.

Quite often you only hear one half of a conversation such as "but sir . . . but sir . . ." From the anguish in the student's voice, you can pretty well guess the other half.

Usually when an instructor makes the mistake of giving instruction over the air, he is met by a barrage of comments from his fellow instructors. These comments may be anything from "Intercom, intercom" to "Wonderful, I was unaware it could be done in that manner."

One particular instructor made this mistake. He realized it immediately, and then came back over the air with "Intercom, intercom," endeavoring to cover it up. However everyone recognized his voice. He did not live that one down for a while.

Being on the wrong frequency can definitely have its disadvantages. A short time ago a solo student made an effort to contact Lowe for landing directions while on Hooper's frequency. One of the instructors, apparently in a mischievous mood, answered him with, "Roger, six-one-two-zero, approach the field from east to west at three thousand, make a vertical descent doing right pedal turns, and land on the fire truck in front of the tower." It goes without question — the student checked his frequency.

Another very common mistake made by students is attempting to make a transmission with the selector switch on the intercom position. The following, related by one of the instructors, apparently broke his student of this habit. The student attempted to call Lowe for takeoff instructions while on the intercom. The instructor answered on the intercom, "Roger, six-one-three-four, cleared to zero-six left, make a vertical takeoff to two thousand, make a left pedal turn and depart traffic to the north." The student turned to the IP with his eyes wide, and said, "Sir, did you hear that? He must be joking!"

Unfortunately, the majority of these accidental transmissions do not provide amusement, but are definitely considered a nuisance and a hazard. We are not trying to tell you how to make your radio calls, but we do ask you to be brief and to the point. We will not try to tell you what transmissions you can make, but we do ask you to use discretion. No one is interested in the fact that you can smell the pine trees while working the contour area, as was overheard very recently on the air-to-air frequency.

Remember, a little common courtesy never hurt anyone, especially to the poor guy who is trying to get a message across to his students.

We are all guilty of these abuses and we must all work together to eliminate them. Remember the saying, "Silence is golden"?

Aircraft Utilization

Under ROAD, the aviation officer is available to the brigade commander as a full-time staff officer. It sounds good, but it isn't working out

Lieutenant Colonel William B. Monts, Jr.

HAVE YOU EVER wondered why, when all else was equal, one man was able to live better on the same income than another man who seemingly is under continual financial duress? The answer is simple — better management.

So, what does that have to do with Army aviation?

Everyone knows we need more aircraft and more aviators to meet our commitment in Vietnam. But wait! Do we really? Or are we, like the man in financial trouble, victims of inefficient management?

When infantry divisions were reorganized under the ROCID concept, a major complaint of commanders was that all organic aviation was concentrated at division level in the aviation company. This was especially true at the battle group level.

While the aviation company TOE provided a combat support flight for each battle group, to consist of one helicopter, two pilots, a mechanic and a radio-telephone operator, these personnel still were a part of the aviation company and only assigned to the group for duty. One of the pilots acted as the battle group aviation officer, but since he was not assigned by TOE, he was unable to function as a staff officer on a continuous basis.

When the Army was reorganized under the ROAD concept, this problem was taken into consideration. In addition to the centralized pool of aircraft and aviators in the division aviation battalion, each brigade headquarters and headquarters company was authorized an organic aviation section. This section consists of four aviators, four light observation helicopters, and the necessary support personnel — all assigned directly to the company.

The TOE provides that the aviation section commander will also serve as the brigade aviation officer. This gives the brigade commander a "full-time" staff officer to advise him on all matters pertaining to Army aviation support. The aviation officer also must do the planning for the most effective use of this support.

Looks good doesn't it? I mean, they've smoothed all the rough edges and really gotten it in proper perspective. There's just one little bug: it isn't working out that way.

Too often the aviation officer is out flying while missions which eventually will involve aviation are being planned. By the time he does sit in on the planning session, it frequently is too late to use the aircraft in the most efficient manner. Had he been there from the start he could have advised his fellow planners on how to obtain the ultimate from the proposed operation.

Who is to blame? Both the aviation officer for not demonstrating the importance of planning to include the aviation section from the start, and the brigade commander for not using the aviation officer in a staff capacity.

Airmobile forces, or teams, employed in offensive operations can transform limited success into sizeable gains, or they can substantially shorten the time required to execute an operation. A classic example of what well coordinated planning can do is the combined arms teams of infantry and armor. The same can and should be done with aviation.

The sole mission of Army aviation is to enhance the capability of the Army in performing its overall mission. To accomplish this mission, aviation must be accepted as a member, a vital part, of the combined team.

In addition to the need for having the aviation officer instrumental in planning, training may well be a key to the team's success. Aviation cannot perform its mission effectively unless it is included in all phases of ground unit training. Troops must be familiar with the types of aircraft that will support their units. They should be indoctrinated in safety procedures for loading, in flight and unloading. To get the job done requires that they be proficient in the techniques of rapid unloading and reorganization in the landing zone.

Personnel who are responsible for equipment must be capable of preparing it for movement and should be familiar with the techniques of loading and securing equipment aboard the aircraft. Special individuals should be trained in selecting landing sites and in the techniques of guiding incoming aircraft to landing spots. This will prove invaluable when small units such as patrols are to be picked up from remote areas and during resupply operations.

Major commanders must direct and ensure that training is carried out. Ground commanders at all levels should welcome every opportunity to incorporate combined training with organic or supporting aviation units. This combined effort will benefit both units and ensure effective teamwork when employed as a fighting team.

Another problem that could be rectified by better management of aviation resources would be the

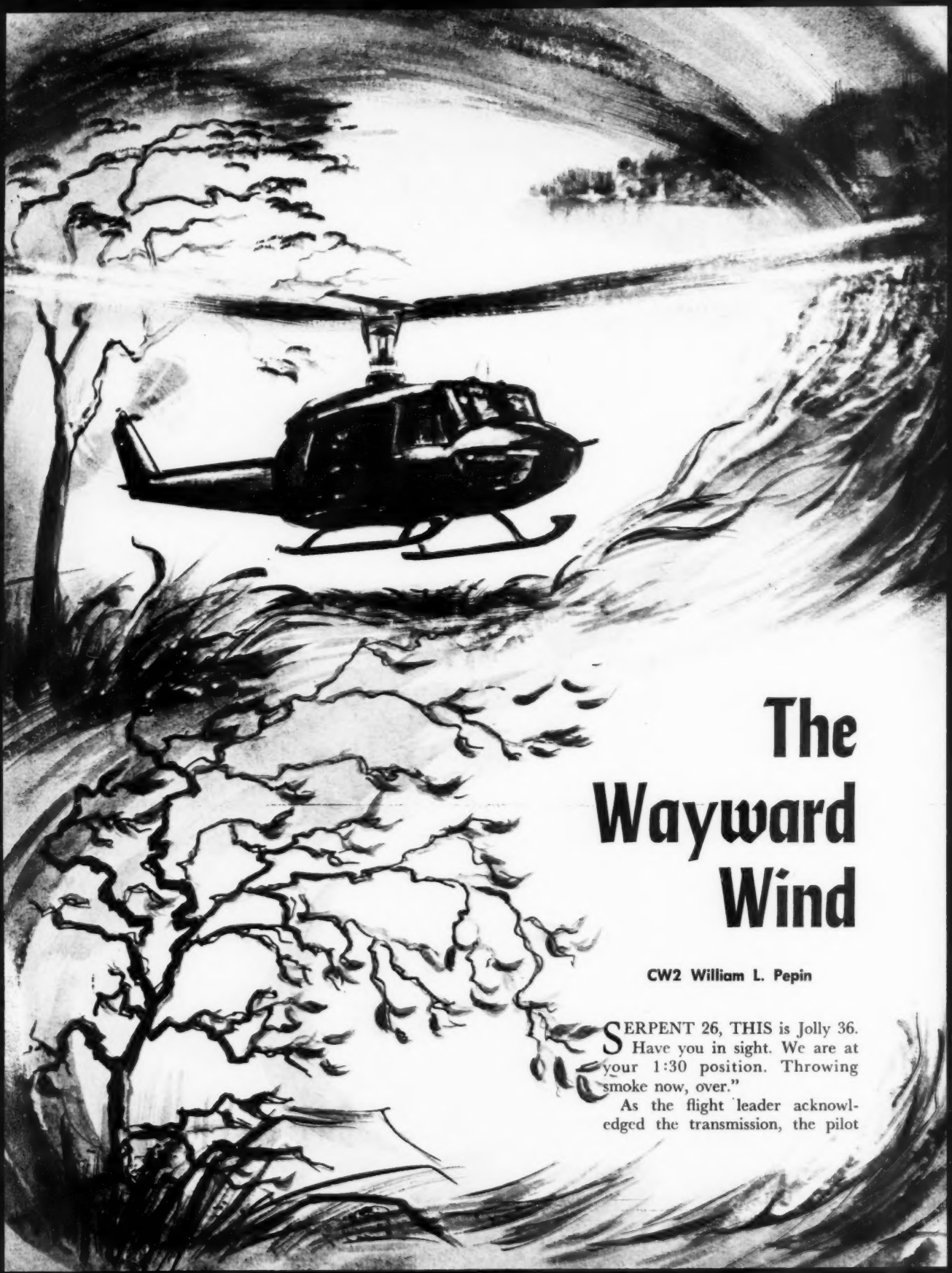
ever-present problem of aircraft availability. There is seldom enough aviation support available to satisfy all justifiable demands. Therefore economy must be practiced and missions must be assigned on a priority basis. Proper planning, coordination and control through using the aviation officer in a staff capacity would result in having the aircraft where they're needed, when they're needed.

The present brigade TOE provides for the aviation section commander to serve as a staff officer as an additional duty, though the emphasis placed on his "staff" responsibilities leaves much to be desired. The professional Army aviator can no longer be content with flying proficiency alone. He also must have a thorough knowledge of the tactical employment of Army aviation and the opportunity to use his knowledge in staff planning.

Perhaps the most effective way to achieve the ultimate from our aviation available in Vietnam would be a plan similar to this:

- Assign a UH-1 qualified aviator to the brigade aviation officer slot, making certain he has at least 60 days' experience as a member of an operational assault helicopter company in Vietnam.
- More important, utilize the brigade aviation officer primarily as a staff officer and secondarily as a pilot.
- Implement a training program for all personnel with emphasis on team effort, teaching them how one area of operations complements the other.

While it certainly is cliche, it still is true that "United we stand and divided we fall." If the right hand knows what the left is doing, they can share the load . . . if not, they may unknowingly be pulling against each other.



The Wayward Wind

CW2 William L. Pepin

"SERPENT 26, THIS is Jolly 36. Have you in sight. We are at your 1:30 position. Throwing smoke now, over."

As the flight leader acknowledged the transmission, the pilot

in the right seat of the lead helicopter began a gentle turn to the right, and yawed widely. Since first light Serpent flight had been ferrying supplies to the tops of mountains that rose abruptly from the coastal plain. It was now early afternoon; they had logged over six hours, and the pilot was getting cramped and tired.

Yellow smoke blossomed from a tiny clearing off the nose of the lead ship.

"Serpent flight, go trail. One minute separation between aircraft. ACL five troops," ordered the flight leader, and the following helicopters slipped into line. The lead pilot eased into a descending turn, looking the landing zone over carefully.

The LZ was extremely small, and lay about halfway up the mountainside in a narrow valley. Slope too steep to sit down, thought the pilot, but we can put one skid on the ground and let the Queen of Battle get aboard. Nope, can't do that — it's too narrow. If we turn sideways we'll get our tail rotor in the trees. We'll have to go straight in and just touch the toes of the skids while we load. Then how do we get out? Pick up, back out a little, then kick in right pedal and let the aircraft fall down the hill to get airspeed. Done it before with no sweat. Wind is real shifty — smoke going in every direction. Not blowing too hard, though, so no problem.

Satisfied with his recon and mental evaluation, the pilot yawed again and started the D model in on final.

For the preceding 3 weeks the aviation battalion of which Serpent flight was a part had been operating in not-so-high but extremely rugged mountains. For the most part the LZs had been single ship size pinnacles, many so small or steep it was impossible to get both skids on the ground. It was necessary to hold power in, touching one skid down lightly to steady the aircraft while loading or unloading. But good fortune had been on the side of the aviators, and aside from a few hairy moments, all had gone well.

This mission was routine: pick up members of a recon platoon and drop them off at their company CP. One trip for each of the four choppers, just a 10 minute flight. Piece of cake.

The lead ship approached the slope cautiously, tall grass bending around the chin bubbles as the toes of the skids felt for the ground. At first one toe and then the other made contact, the pilot made an almost imperceptible power adjustment, and the D model hung there, balanced like a dragonfly on a grass stem.

The lead pilot eyed his position disapprovingly. The slope was steeper than he had judged — the tips of the rotor blades were whirling very close to the ground in front of the helicopter. Trees pressed tightly on either side. He would have to move straight back at least 25 feet, for the load would surely be too heavy to allow a vertical liftoff.

As the infantrymen clambered aboard, the helicopter lurched slightly. Less than 30 seconds after touchdown the crewchief announced over the intercom, "OK sir, we're up!" The aircraft lifted heavily up and backward, away from the slope.

At once the pilot noted that the helicopter had required far more power and aft cyclic to get airborne than he had anticipated, but he was unaware of the reason. Instead of the recommended ACL of five, he had six passengers on board; three of them were squatting on the floor with their backs against the pilot's seats. Everyone on board was hanging precariously on the ragged edge of the forward c.g. limit. Then Mother Nature entered the game.

The wayward wind, which had been light and shifting, settled down to blowing from the five o'clock position, increased noticeably in velocity, and added a series of short, sharp gusts for good measure. As the wind tried to blow the tail to the left and into the trees, the pilot applied left pedal. This placed a greater demand on the already straining turbine, and engine rpm promptly began to decrease.

Then the first gust hit, and the tail lifted. The pilot attempted to move the cyclic to the rear — and the stick hit the aft cyclic stop. The forward tips of the main rotor dipped to within inches of the mountainside. Just as it seemed certain the blades would strike the ground the gust ended as abruptly as it had begun, and the tail dropped slightly. The audio warning system was screaming in the earphones. The tachometer read 5900 rpm, but stabilized — not enough to do any good and nowhere to go.

Then the second gust reached the aircraft. Once again the tail lifted and rotor blades reached for the ground. But now the pilot had realized the problem and shouted for the crewchief to get the troops to move aft.

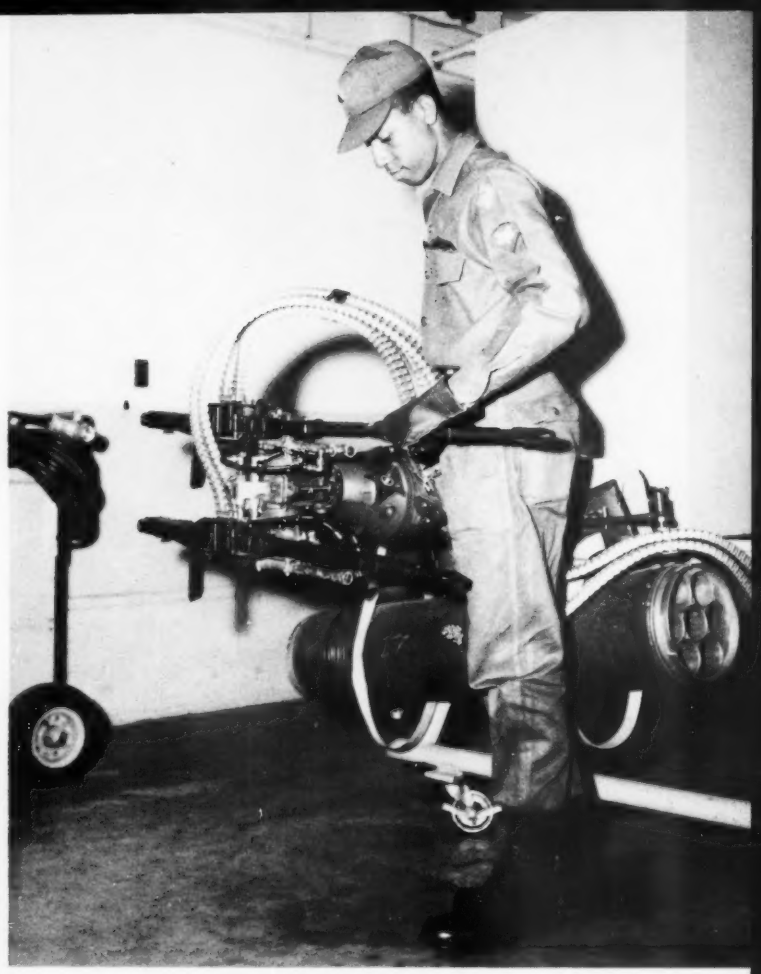
Three, perhaps four, times the nose dipped as gusts rocked the ship. Each time it seemed that the blades must surely strike the ground. Then almost simultaneously the passengers moved aft restoring the c.g. and the wind, tired of its mischief making, died as suddenly as it had risen. As engine rpm built rapidly, the pilot backed clear of the LZ, made a right pedal turn, and let the aircraft slide down the mountainside, quickly building airspeed.

The flight leader sighed deeply and keyed the radio.

"Serpent flight, this is Serpent 26. Better make that ACL four troops!"

You Can't Beat The Establishment

(of good safety procedures)



Students in the U.S. Army Ordnance School's aircraft armament repair course receive intense instruction on safety procedures. For example, the soldier at right is pointing out that a sure way to make conventional type machine guns safe is to remove the barrels.

Captain Michael J. Williams

SOMEWHERE in Vietnam: Hazy in the darkening twilight, the returning flight of gunships materialize over the green horizon as a single pulsing dot. The approach is at treetop level, and the noise of the weary machines reverberates across the sodden land in all directions. As they move to their final, the sound grows and seems to saturate the already heavy air, until, like well-strung beads, the Hueys drop simultaneously to the base camp pad. While rotors still revolve in the sad, softly swishing beat which sounds the postlude to every mission, the crews rapidly perform their armament safe checks:

Rocket system: off - safed - arm switch — OFF.

Grenade Launcher: power switch — OFF.

Machineguns: clear.

Miniguns: clear.

The crewmembers, having completed their tasks, climb down from their aircraft and leave the field, secure in the knowledge that the armament subsystems behind them are safe. To the ships come the maintenance crews to perform their operations — to perform their operations on dangerously loaded and unsafed weapons, to be wounded or possibly killed! But HOW? WHY?

While South Vietnam has proved to be an excellent testing ground for battle, proving an impressive array of armament subsystems for the UH-1 series of helicopters, the war there has also shown that these same weapons must be handled within the requirements of a well-formulated safety program. Some problems arise because of the complexity and newness of the weapons concerned, but most accidents result from two causes: people either fail to comply with SOPs and clear the weapons systems improperly or incompletely or people assume that hot systems are not and act and treat the weapons accordingly. (Are you **sure** you got all six bullets out of every minigun last time you checked the little devils? You didn't walk in front of the rocket launcher while the mechanic checked the firing circuits? Oy!)

Correct and complete employment of all safety devices organic to each system is basically necessary, augmented in some cases by mechanical "fail-safes" and in all

cases by the liberal application of good common sense.

Along the safety fixture line, *PS Magazine* has suggested the use of a cleaning rod between the barrels of the minigun systems to keep the barrels from rotating and thus avoid accidental firing. A different approach, now in development, involves a bullet catcher-deflector type of hardware which would slip over the ends of the multibarrelled weapons.

Of course, neither of these, nor any other gadgets, will decrease the need of the crewmen to properly safe their weapons in accordance with all established safety procedures.

At the U. S. Army Ordnance Center and School, maintenance training given students enrolled in the Aircraft Armament Repair Course (MOS 45J20) is closely integrated with intense and continuous safety instruction.

Faculty members in the Aircraft Armament Branch of the school have devised their own augmentation systems, which can be used in addition to the existing electrical devices to make the safing of the weapons as nearly foolproof as possible.

These mechanical augmenting devices use the best features of a number of special systems and also employ warning flags so that personnel in the area can see for themselves the actual state of the weapons.

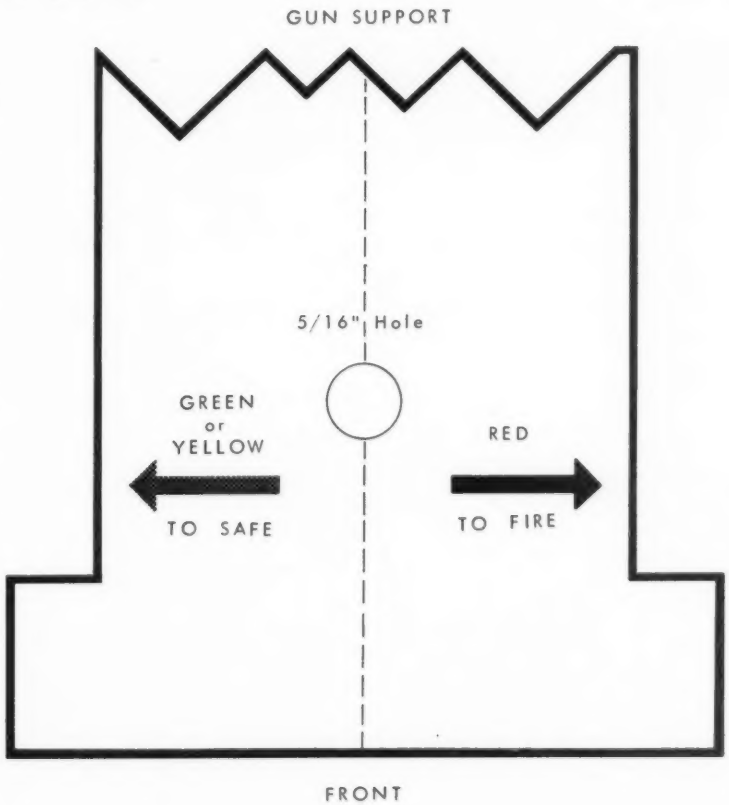
While it may be correctly argued that all weapons should be treated as deadly and uncleared, some means of advising personnel that they are definitely so is advisable, both for on-ground safety reasons and to eliminate any possibility of safed weapons getting off the ground.

As prescribed by the school's system, aircraft mounting conventional 7.62 mm machineguns are cleared through removal of the barrels during deplaning. In accomplishing this and the procedures required by other safing systems, personnel are taught to board and deplane the aircraft without exposing themselves to the front of any weapons systems. Using this procedure, rocket pods are safed against stray voltage and accidental firing by disconnecting the cannon plugs immediately after firing. Warning flags can be attached to both these systems after the safety procedures are accomplished.

Safing the M-134 minigun in the M-21 subsystem is a more involved matter because it is a more exotic weapon. With the M-21 subsystem the object of safing procedures is to prevent the weapon from firing by making it impossible for either the bolt to close or for the barrels to rotate. The safing problems involved are somewhat complex because of the difference between the system and conventional weapons, but the procedures taught by the Ordnance School are simple. With practice, the process, which is designed to use preflight and postflight SOPs by both the crew and maintenance personnel, should take no more than 10 seconds to implement.

The first step in this safety procedure is to clearly mark directional arrows on the gun mount, just above the barrels, which indicate the direction of rotation of the barrels to fire or safe. A red arrow indicates the firing rotation, while a green or yellow arrow is

Figure 1 depicts where the arrows are to be pointed on the gun mount and the location of the hole to be drilled for use of the safing system



recommended for the safing direction (fig. 1).

The next step is a modification of the gun mount above the barrels. This consists of increasing the diameter of the hole located in the center of the mount to 5/16th inch to permit a safing rod to be inserted through the hole and between the barrels to prevent the barrels from rotating. If during the insertion of the rod it is necessary to rotate the barrels, the arrow on the gun mount serves as a ready reference for indicating the safe direction.

Even after this rod is installed, however, it is also necessary to safe the gun by preventing the bolt from closing and allowing a possible misfire. To do this, the outboard safing sector pin and rear cover pin must be removed and the safing sector cover opened. With the reinstallation of the safing sector pin while the cover is still open, the gun is safe and ready for cleaning and maintenance. But this alone will not clearly indicate to surrounding personnel or to crewmen that the armament subsystems are safe and cannot be fired.

A visual warning system is employed, therefore, using two red flags per weapon, about 30 inches long, to show that the safety operations listed above have been completed. One end of a chain, about three feet in length, is permanently fastened to the safing rod. The other end is clipped to the safety sector pin after it is reinstalled by a snap fastener. One of the flags is attached to this slip, while the other is permanently attached to the top of the safing rod. When the operation is completed, the flags will indicate that the armament system is safe to anyone within sight, with one flag to the front and the other to the rear.

After maintenance and reloading, the cover is closed and the rear cover pin and safing sector pin are installed. The clip with the flag is then attached to the top of the safing rod. This places the two flags together, indicating to those personnel in the area that the weapon is loaded. The safing rod can be removed as part of last minute preflight preparations. Installation of the device is portrayed in figures 3 thru 8 (next page).

Two additional safety precautions can be used to make the system less dangerous. Before landing, the M-134s can be fully depressed with the action switch on the sight. The trick is to keep the action switch pressed down while the system is quickly switched from the arm to off position.

After the guns are reloaded, they can be cranked manually to the 90° vertical position with the safing rod still in place until the aircraft is ready for flight. The guns can be left in that position until after the safing rod is removed and the aircraft is off the ground. At that time, the weapons can be returned to the desired operating position with the electrical control system.

The safing device can be carried on the aircraft when not in use, and can be used immediately after landing. The 5/16 inch safing rod is more desirable than a cleaning rod for this purpose since it is less likely to bend.

We reiterate and reemphasize: the device is not mistake proof. Like all other systems it requires conscientious application by safety-minded personnel. It requires continuous checks of safety practices and systems implementation, and it requires that safety procedures be included in unit SOPs *and* enforced.

Materials used in the Ordnance School's minigun safing device are available in the service section of a DS or GS company. Materials are listed in figure 2.

Use of the preceding systems will *almost* eliminate any accidents, but the most important element of any well-formulated safety program remains the same: well-trained personnel to properly implement the unit's established safety program.

Figure 2

MINIGUN SAFING DEVICE

1. **Barrel safing rod**
   Length: 30 inches (approximate)
   Diameter: 5/16 inches
   Length from step to tip: 11 inches
   Material: steel

2. **Chain**
   Length: 36 inches

3. **Flags (2 each)**
   Width: 3 to 4 inches
   Length: 30 inches
   Color: red or other highly distinguishable color

4. **Snap fastener — to clip to safety sector pin**

Figure 3: Holding the mechanical safing device in his hand, an Ordnance School demonstrator shows proper method of dismounting an aircraft mounting the XM-21 subsystem. He has stepped over the rocket tubes and is approaching the minigun from the inboard side

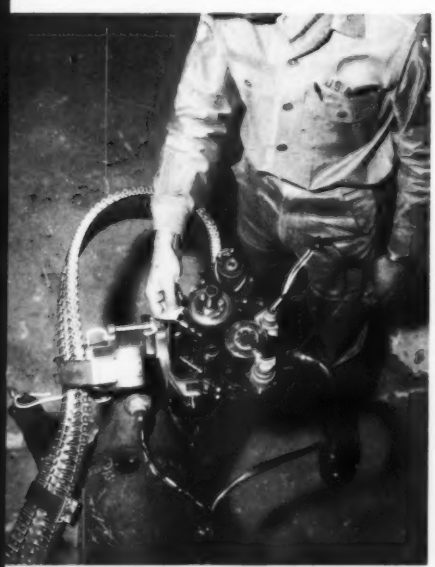
Figure 4: While inserting the safing rod, the demonstrator is careful to rotate the minigun barrels in "to safe" direction. Notice configuration of safing device

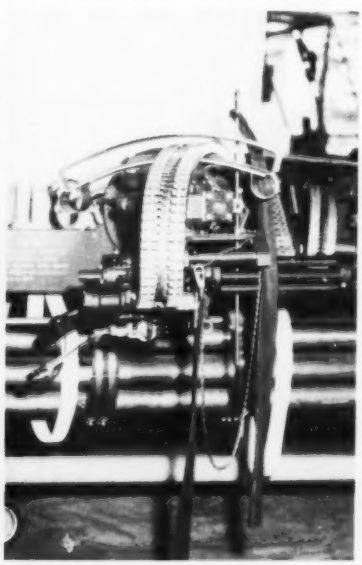
Figure 5: The third step is the removal of the outboard safing sector pin. The pin is then clipped to the snap fastener (in demonstrator's left hand)

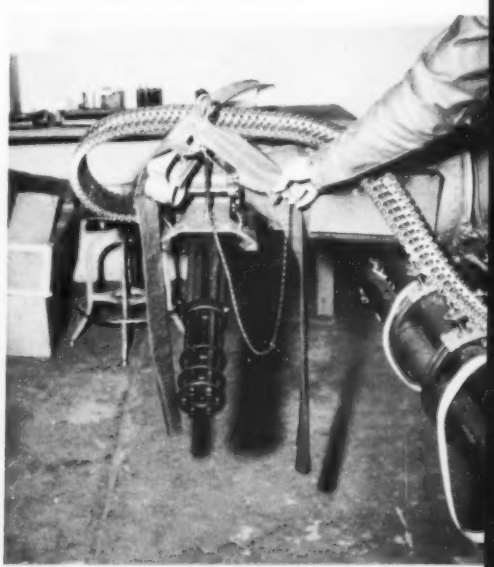
Figure 6: The instructor removes the rear cover pin prior to opening cover. The barrel of weapon is depressed in order to show this step. The safing rod extends from barrels at left

Figure 7: This view of the safing device clearly shows the configuration when properly installed. The separated flags indicate that the weapon is not loaded. In this position the gun is prepared to be loaded

Figure 8: Both flags hanging from the same point indicate that the weapon is loaded and only kept from firing by the safing rod. The flags have been separated slightly for illustrative purposes. The gun should now be depressed to full vertical to further enhance safety







Cleared To Land—Its Legal Portent

What is negligence? Put simply, it is failure to perform a duty or exercise the care that circumstances demand. This applies equally to air traffic controllers and aviators

Lieutenant Colonel Richard A. Rusk

YOU KNOW very well that today's weather will be bad. For several days the television weatherman has been reporting the advance of a cold front. Suddenly, everyone seems to realize that the weather is going sour and begins scurrying home. Action goes from dull to slack to busy to hectic to frantic in less time than it takes to tell about it.

From the tower, you tell the pilot of an approaching aircraft about the storm that is 40 miles out but completely forget to tell him about the isolated thunderstorm 20 miles out. He skirts the former but ploughs head-on into the latter. The bird breaks up under stresses for which it was not designed and falls into a local farm in pieces. Farmer Jones is hit and his widow sues the U. S. Government for negligence. She wins a large money judgment — and the negligence is yours!

Farfetched? Ridiculous? No. A case with nearly an identical set of circumstances actually happened. Even so, why should you be interested?

Well if for no other reason you should be interested because you may be involved in a damage suit. You may, as an air traffic controller, be charged with negligence in an air accident involving large sums of money.

What then is negligence? In its simplest form it is a failure to perform a duty or to exercise the care that circumstances demand. In court a lawyer proves negligence by proceeding through a brief list of its elements. If each is present (and proved) so is negligence.

Duty involves people acting in such a way as not to cause the unreasonable risk of harm to others or their property. If breach of duty is the actual cause of the accident, etc., and results in damage, you have a prima facie case of negligence.

The airliner was struck from above

The Army-Navy-Air Force-Federal Aviation Agency Procedures for the Control of Air Traffic (ANC/PCAT) Manual V prescribes the duties and responsibilities of air traffic control personnel. In essence it says that the primary objective of ATC service is to promote the safe, orderly, and expeditious movement of air traffic. This includes preventing collisions between aircraft and obstructions, expediting and maintaining an orderly flow of air traffic, assisting the person in command of aircraft by providing such advice and information as may be useful for the safe and efficient conduct of a flight, and notifying appropriate organizations regarding aircraft known to be or believed to be in need of search and rescue aid, and assisting such organizations as required.

In general, an airport traffic control tower is responsible for issuing clearances and information to aviators to protect air traffic by aiding pilots in the prevention of collision between aircraft operating on the ground; aircraft, vehicles and personnel operating on the movement area; aircraft landing and taking off and in the traffic pattern; and aircraft operating under instrument flight rules (IFR) after control of such aircraft has been passed to the tower by the appropriate air route traffic control center. An airport traffic control tower is also responsible for issuing and relaying information and clearances which will avoid or prevent unnecessary delays.

Several notable court cases have led to assigning these duties to the ATC. In one case the court said that "Cleared to land" issued to an aircraft in the traffic pattern authorizes the pilot to commence his approach immediately wherever he may be in the traffic pattern and implies that there is no plane ahead of him and that he may make his turn at his discretion, landing at once on the designated runway. In this particular case it was held that in clearing two planes for the same runway at approximately the same time control tower personnel failed to exercise reasonable care and their negligence was actionable.

In another case the court held that the responsibility of the control tower to give information for the prevention of collisions had been fully discharged. In this case, the tower had radioed warnings to the pilot of one of the two planes on a converging course and the pilot acknowledged, reporting he had the other plane in sight. Flight conditions were visual flight rules (VFR).

A later court similarly found the focal point of ultimate responsibility for safe operation of aircraft under VFR to rest with the pilot. It ruled that even in the presence of tower negligence where a pilot contributes his own negligence by violating rules of right-of-way his action precludes recovery. It was stated and reiterated that the function of tower personnel is "to assist the pilot in the performance of the duties imposed, not relieve him of those duties."

In the days long past, sovereign immunity prevented the government from getting involved in acts in violation of duty by a government employee. Since the Tucker Act of 1887, however, a remedy for contract claims against the United States has been available. In the '40s, the congressional calendar was so choked with individual actions against employees of the federal government that the Federal Tort Claims Act (FTCA) was enacted to give specific remedy through the court system.

Dating from 1946, the FTCA was designed to provide a comprehensive judicial remedy for claims against the U. S. involving, with certain exceptions, damage caused by a negligent or wrongful act or omission of an employee of the federal government while acting within the scope of his office or employment, under circumstances where a private person would be liable in accord with the law of the place where the act or omission occurred.

One specific exclusion merits mention. The FTCA shall not apply to any claim "based upon the exercise or performance of a discretionary function or duty on the part of the Federal agency or employee. . . ."

One of the leading test cases of the government's liability came about as a result of a midair collision at Washington National Airport. Both an airline carrier and a military aircraft were cleared to land on the same runway at nearly the same time. The weather was excellent and the visibility unimpeded. On its final approach the airliner was struck from above and behind and cut in two. It plunged into the Potomac River, killing all on board. The military craft fell into the river as well, but miraculously the pilot lived. On the final appeal, it was ruled that the government was liable for its controller negligence and that the airline contributed by failing to obey recognized landing patterns. To present a feeling for the order of magnitude of damages, the estate of one decedent was awarded $100,000, half from the U. S. and half from the airline.

Two important governmental legal premises fell in this case. The U. S. argued that the government had not consented to be sued for negligence of control tower employees regulating air traffic at a public airport, since the FTCA limited U. S. liability to that which

Cleared To Land—Its Legal Portent

a "private individual" would have "under like circumstances" and the claims arose from performance of a discretionary function or duty, thereby being outside the scope of the FTCA.

The court's lengthy response boils down to this: a number of towers (at that time) were operated by municipalities or corporations who would be liable for their controller actions in just such a manner as was sought to be imposed upon the government here; and tower operators merely handle operational duties where there is no room for policy judgment and decision, thus outside discretionary functions and duties referred to in the act.

In a 1949 case, workers repairing taxiways were instructed to watch the tower for warning signals and to move to a safe place when they were received. The tower cleared an Army aircraft to taxi and it collided with a tractor of the work crew. It had given no signal warnings to the tractor operator, who was in fact in a "blind spot." The court ruled that the tower operators were under a duty to exercise reasonable care to guard against collision and that it was up to them to inform themselves of the tractor's location and not to give clearance to aircraft until the way was clear. One man was severely injured by a propeller. The government was held liable.

Recovery was also permitted where the tower directed a plane to land at night on a runway upon which a stalled truck without lights was being assisted by a second truck, also without lights.

Government liability was found again where ATC cleared an aircraft to land only to immediately notice a craft without radio on the runway. The latter ignored light signals and the two collided. The court said the controller should have advised the approaching airplane of the danger.

The government was successfully joined as a third party where an airline passenger was injured by being thrown about inside the airliner during an evasive maneuver. The collision courses were observed on radar by two operators on the ground; neither issued a warning.

In another case governmental liability was established as ATC failed to give continuous weather information upon which the flight crew relied.

In one case when air control personnel transmitted incorrect information to rescue parties concerning the identity and location of the flight in distress, the U. S. bore the brunt of their error. Passengers in this example were ordered to parachute, but air rescue teams were told the wrong area to search. This mistaken action worsened the victims' position.

The control tower operator is in an extremely responsible position, but he doesn't have absolute control over the aviator. For example, one controller cleared a student to taxi on the ramp, but not to collide with a government car

In an area less clearly defined, a controller gave a student flier clearance to take off, along with the standard phrase "Watch for turbulence." The student crashed in the wake of a DC-8. The court found the tower operator negligent in his judgment of the danger created by air turbulence.

On the other hand, quite a few who have taken recourse under the FTCA haven't fared so well. No government liability was found in these three cases — where a controller cleared an aircraft to another airway; to land under VFR (accepting the pilot's statement on sighting the field); or to take off when the pilot lacked the proper license. Likewise government negligence was found not to be controlling where a departing airliner developed an engine fire; a member of the Armed Forces sought relief under FTCA; helicopter wake turbulence was alleged to have caused an accident; or in a different wing-tip vortices incident. Further, several instances are in evidence where aviator contributory negligence existed to bar recovery.

In one example the United States brought and won a case where the tower had cleared a student to taxi on the ramp, but had not cleared him to collide with a government car!

It is then well established that a control tower operator may be liable if he is negligent in the performance of his duties. The United States may also be liable for the negligence of control tower operators unless their conduct falls within an exception to the waiver of sovereign immunity granted by Congress in the Federal Tort Claims Act.

There are 10,000 airports in the United States with commercial airlines serving about 550 of them. Only 22 are of major importance in the category of Chicago O'Hare. These 22 handle 68 percent of all the air traffic in the country. At peak times, 6,000 aircraft are in U. S. skies looking for a place to land. Are our air traffic capabilities "up" to the challenge? Think about it yourself the next time you issue, "Cleared to land."

Soldier

The soldier not only must be built up physically and mentally, he also must acquire moral and spiritual values

Sergeant Major Glenn E. Owens

A TOUGH soldier in battle is hard and well coordinated. His mind is alert to dangers around him and he is thoroughly grounded in the principles of his arm of the service. He knows what he is fighting for and believes it is worth the effort. Physically, mentally, morally and spiritually he is prepared to make the supreme sacrifice for the things he cherishes. This, then, is the "tough soldier."

But, toughness has nothing to do with how much he can drink, the obscene words he knows, how vulgar he can be, or in how many ways he can show his lack of respect for himself and everybody else. Yet to many of our young soldiers the word "tough" connotes just such characteristics, even though it is well known that that kind of soldier does not win battles. He is the kind of "tough" who digs a foxhole so deep that he needs a ladder to climb out. He is the one who cowers in the bushes when the fighting begins because he does not have standards — he does not have a sense of values. He will not fight for anything because to him there is nothing worth fighting for.

Some of the toughest soldiers I knew in World War II, Korea and Vietnam were quiet, gentle men. An outstanding instance of cold courage that I recall occurred when an aircraft was down in Vietnam. Even after repeated warnings, another aircraft went in under heavy fire to try to save the downed crew.

Toughness! Gentleness! Courage! Indeed, all the human qualities that make the soldier are part of our training program, or should be. Military training recognizes the nature of the man and makes provisions for his well-rounded development. The soldier not only must be built up physically and alerted mentally, he also must acquire a sense of moral and spiritual values.

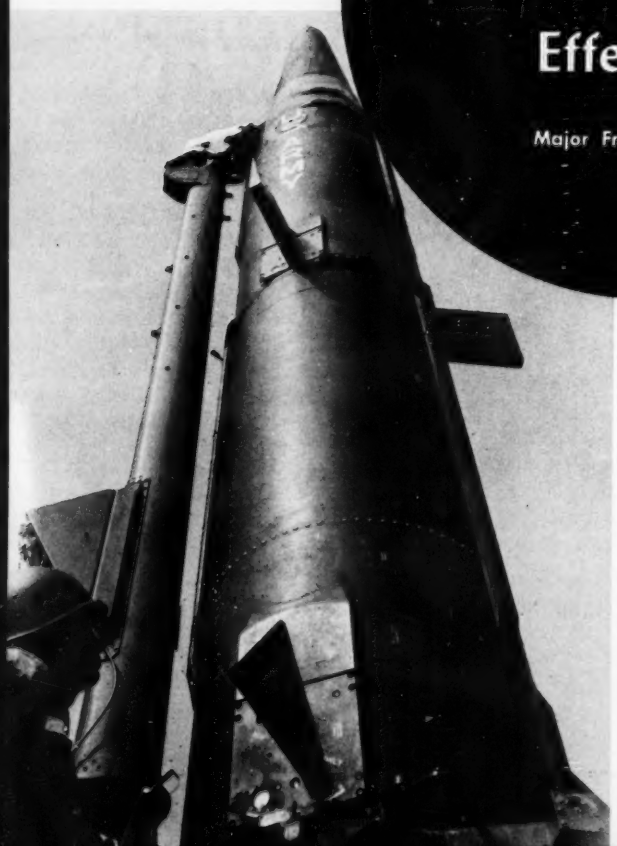
We have had long experience teaching military subjects and physically developing men. The records since World War II show we have been successful and there are few who would challenge our claim of being experts. Where the mind is concerned, we have for several years been using a far reaching and successful method to stimulate our soldiers. We have offered them educational opportunities far beyond the scope of technical military training. We have helped them develop their minds and improve their skills so they may become better soldiers, as well as citizens.

In another field of training however — that of moral and spiritual values — we must not let up on our efforts. We do not need men who fight only because they are ordered to, men who are resentful and careless of their obligations and of their companions' lives.

There is no reason why the behavior standards — both moral and ethical — of a group of soldiers should not remain as high or higher than those of a comparable group of men anywhere in the world. The average young soldier wants to do the right thing and he will if he knows what it is. He wants to get along in his unit. He wants the good opinion of his associates and of his superiors. He is ambitious and he wants to get ahead. What he needs more often than not, is proper *guidance* and proper *leadership*. But these must be accomplished by a strong hand to guide him.

Use All Fire Support Effectively

Major Francis X. Delvey



"GUNSHIPS CLEAR out of the area. We are going to bring in artillery." All too often attack helicopter team leaders in Vietnam hear this call from fire support coordinators or ground unit commanders. Undoubtedly artillery forward observers also have been told to check fire as attack helicopter teams or tactical fighter aircraft were brought in to strike targets that the artillery was engaging.

This technique of using only one form of fire support at a time is unnecessary. It is perfectly safe and proper to use multiple fire support agencies simultaneously. This is particularly true if the target area is large. Each fire support category has elements of information that are necessary for safe operation when being employed on the same target with other fire support systems.

Consider a target that is to be attacked simultaneously by conventional artillery, TAC air, and attack helicopters. Preplanning, when possible, will give the best target coverage and effort, but is not essential. The target can even be engaged as each type of fire support becomes available.

Certain common elements of information are necessary to all types of fire support. Simply stated each agency needs to know where the target is, where the friendly forces are, and if the friendly forces are moving, in what direction and with what speed.

Generally speaking, certain types of fire support require more airspace than others. This is always considered but is especially vital for efficient preplanned strikes. Ground artillery (as opposed to naval gunfire) is normally stationary in an established fire support base. Artillery units will be firing from a fixed position, along an azimuth to fire to the target. On large operations it is not uncommon for artillery from more than one fire support base to be able to reach the target. The choice of artillery locations and types of artillery only makes the fire support coordinator or the ground unit commander more flexible in his method of simultaneous target attack.

Once the artillery fire support has been selected and the fire base and azimuth to fire line announced, aircraft can remain clear of this line.

Air Force fighter aircraft, because of their high speed, need more airspace than attack helicopters. Once the forward air controller has the artillery data, he can select and announce the direction of attack and break of the TAC aircraft. This will identify the intended flight pattern of the high performance aircraft.

Attack helicopter pilots pass on many tips to their successors. Here's a few for you

Attack helicopters, while they may not deliver the most devastating ordnance, are by far the most flexible means of fire support. After checking with the fire support coordinator, artillery and TAC air are assigned sectors of the target and the attack helicopter team leader can select and recommend his portion of the target. He will avoid the artillery azimuth to fire line and the TAC air flight pattern. If severely cramped for airspace the attack helicopter team leader can contact the forward air controller on UHF radio and request adjustment of the flight pattern of the high performance aircraft to allow some airspace for the attack helicopter team. The use of UHF radio will avoid tying up the ground FM radio during critical phases of the battle.

In guerrilla warfare most targets are fleeting. If we have a suitable target and multiple fire support agencies are available to engage the target, it is often desirable to use this fire support simultaneously. Certainly there will be times when the commander or his fire support coordinator may hold various types of fire support "on call" for injection at another phase of the battle. However, all too often the commander or his fire support coordinator fails to realize that it is possible to use multiple fire support agencies in a simultaneous attack on a common target. One of the major causes of this lack of technique is non-battle training safety criteria.

Training safety will not let various fire support agencies practice attacking the same target simultaneously. Such a training policy does not take into account the fact that we may be receiving casualties from the enemy force in the target area during the time we are delivering our firepower in increments. We have on occasion paid dearly when two fire support means were held off a target while only one fire support agency was used to fire on the enemy force that was causing allied casualties.

As creatures of training and habit we tend to apply what we have practiced in training rather than use the more imaginative methods that combat calls for.

Although the separate fire support agencies have not practiced simultaneous attack of a common target, the leaders are highly trained officers who will quickly advise each other or the fire support coordinator if the attack jeopardizes either the ground troops or support aircraft.

Above, a platoon leader of the 1st Infantry Division calls for fire support during an assault in Vietnam. Below, an Army aviator of the 1st Cavalry Division (Airmobile) pinpoints the locations of friendly and enemy troops. To obtain the most effective fire support, both must exchange all significant intelligence concerning the combat situation

The forward air controller is an officer and pilot. The attack helicopter team leader is either a commissioned officer or a battle seasoned warrant officer. The artillery will be controlled by a highly trained, often fully seasoned, combat veteran. A simultaneous attack of a common target is well within their capabilities.

Other problem areas and misuses of attack helicopters are common in Vietnam. Many of these problems can be brought up at premission briefings and on liaison visits to ground troop command posts. Aviation personnel should continually strive to make the forces they support aware of these problems and should suggest alternate methods and techniques to achieve better, less costly results. Some of the more serious and most common problems, as well as suggested solutions to these problems, are discussed briefly.

On occasion the ground commander will instruct the attack helicopter team to strike in a given direction, such as "Attack from north to south." This is not desirable. The ground commander is not trained in attack helicopter cardinal rules; he may not realize the limitations of attack helicopters; and he will often subject the attack helicopter team to fires he would not ask his ground troops to expose themselves to. Attack helicopter teams make every effort to honor the ground commander's requested direction of attack, but the final decision on a direction of attack rests with the team leader.

If after considering cardinal rules and weapons limitations the team leader feels he cannot comply with the requested direction of attack, he should notify the ground commander before starting the first firing pass. He should also tell the ground commander the reason for selecting another direction of attack. An example of this call might be: "I will attack from east

to west. I observe friendly forces south of the target and my ricochets and long rounds would endanger them."

A better method for the ground commander is to briefly give the attack helicopter team leader any special considerations such as, "Another friendly unit is east of me and moving toward objective red." This permits the attack helicopter team leader to consider all critical information before selecting the ordnance, direction and angle of attack.

Numerous methods are used in marking targets and designating friendly unit locations. Some of these techniques include: map coordinates, colored smoke grenades, polar coordinates from a prominent landmark, use of points of origin, flare guns, mirrors, panels, tracer smoke rockets, or artillery marking rounds.

An attack helicopter team leader must be prepared to receive, or call for, any of these signals to identify friendly ground units or enemy locations. One of the cardinal rules for attack helicopter employment is to positively locate the friendly units before firing. Normally, when not operating in high dense jungle, the team leader will call for a smoke marking grenade from the friendly ground units. This is usually a mark of the forward units. To designate the target, a common practice for the ground commander is to then give a range and azimuth from the smoke to the target.

Ground commanders are changed frequently. This is caused by rotation policy, friendly casualties, and an effort to allow officers to get experience as ground commanders in combat. Unfortunately, marking methods are all too often forgotten in training replacement ground commanders. Sometimes it is necessary for attack helicopter teams to assist new ground commanders in marking their positions and then "milk" from them the location of the target. Liaison visits before an operation can smooth out this problem while no combat pressure exists.

Attack helicopters frequently are misused to furnish blocking fires. Normally, this role is accomplished more efficiently and more continuously by artillery. When attack helicopters are employed "on station" to assist ground elements and are not attacking targets, they can often be sensibly employed in a screening role.

Sometimes it is necessary for the attack helicopter team leader to suggest this role to the ground commander, especially if given such instructions as, "Gunships orbit somewhere out of the area until I call you in."

It is possible for an attack helicopter team to screen lightly wooded escape routes and streams for enemy activity while artillery blocking fires are used in the densely wooded areas. If the screening aircraft receive fire or sight enemy personnel, they are immediately able to react with fires.

Often blanket firing approval can be given for large portions of the operational area. This is most desirable. When it is not possible distinct rules of engagement and sources of firing approval can be quickly arranged by radio.

During premission briefings and liaison visits the roles of air blocking and screening can be discussed. Aviation personnel should attempt to point out how they can best serve as attack helicopter teams. This assists ground commanders in sensibly planning for attack helicopter teams and facilitates early firing clearance on targets.

Frequently the supported ground troops hear enemy fire on attack helicopter teams and assume that the fire team is aware of the enemy fire. Attack helicopter teams will either avoid the area of fire or will return fire or request to return it. If the helicopter team continues to orbit and takes no action against the enemy force, then the ground forces should assume that the air team is unaware of the enemy's presence.

It is possible through commander's conferences and notes and through premission and liaison visits to encourage ground com-

Attack helicopters often are misused to furnish blocking fires when usually this is accomplished better by artillery. Below: 1st Cavalry Division (Airmobile) artillery provides such fire in an engagement near Qui Nhon in Vietnam

Aviators should not attack over the heads of friendly forces

manders to bring this problem to the attention of their junior leaders.

The problem of hearing enemy fire is more acute in the Huey-Cobra attack helicopter. The enclosed canopy makes audio detection of enemy fires virtually impossible.

Once a target has been designated by the ground force it does not mean that attack helicopter fires cannot be adjusted. Ground elements may see the aircraft striking the wrong treeline or canal, which is highly possible when the target may be only 50 meters or so apart. Then two weeks later the helicopter team may learn of this when an infantry or cavalry friend chides one of the team members about striking the wrong treeline. This is a waste of fire support. It is perfectly correct and sensible for the ground unit to advise the attack helicopter to adjust his fires. It might be as simple as this call, "Strike the next canal line closer to us" or "Move it out to the west another 100 meters." Ground units *should* make a fire adjustment after the first firing pass and before the second. This ensures maximum effect from the ordnance delivered.

One of the cardinal rules of attack helicopter employment is to avoid attacking over the heads of friendly units. There are several reasons for this. One is that as the enemy is usually on line in any deliberate opposition to our movement he will have most of his weapons oriented at our friendly ground forces. To attack over the friendly forces would be to attack into the greatest number of enemy weapons. A second reason is that this method of attack usually does not line up the long axis of the target with the long axis of the helicopter weapon's beaten zone. A third reason is that brass from machine or automatic guns and expended rocket caps will fall on friendly troops. Only the most seasoned troops do not get rattled by this falling brass. The low altitudes and airspeeds used by attack helicopters does not make the falling brass dangerous, but the noise and sight of the brass is disconcerting.

The low angle of attack sometimes used by helicopters causes rockets to pass close over the heads of friendly troops. This is another consideration for not firing over the heads of the friendlies.

Most field commanders are normally located behind their advance elements. This allows the commander necessary freedom to command his entire unit and to employ various means of fire support. Most field commanders have some idea of the attack angles used by fighter type aircraft. However, unless the field commander has seen combat in Vietnam, he usually is not familiar with the low angle of attack that helicopters use while engaging most targets.

A rocket fired by an attack helicopter may pass only 10 feet above the trees that mark the known position of friendly units. This rocket, because of the shallow angle of attack, may detonate 150 meters or more in front of the friendly troops. An inexperienced field commander, even a very cool one, will often get upset when he sees friendly ordnance flying only a few feet above the heads of his troops. Attack helicopter team leaders are trained to make every effort to avoid attacking over the heads of friendly units.

In some cases attack helicopters are forced to fire over the heads of friendlies if they are to furnish fire support. This may be caused by deployment of large numbers of friendly forces or by the nature of the terrain, such as when contact is made on a very narrow canal or treeline down which friendly forces are moving.

When it is necessary to fire over friendly units, the helicopter team leader should notify the ground commander and remind him of the falling brass. Present training does not prepare our ground troops for this problem. Some allied forces and even unseasoned U. S. forces have mistaken the brass for either friendly or enemy fires and have taken inappropriate actions, such as withdrawing or wastefully expending ammunition.

Several points in this article are intended for both ground commanders and attack helicopter pilots. For ground commanders there are some points to consider in training and advising the troops and some personal do's and don'ts. For aviation types there are several points to bring up to field commanders at liaison visits, premission briefings, and planning conferences. In summary these points are:

- A common target can be attacked simultaneously by multiple fire support systems such as artillery, TAC air, and attack helicopters.
- It is best if ground unit com-

manders do *not* request a specific direction of attack from the helicopter team leaders. The team leader may violate a principle of employment in an effort to attack as requested. A better technique is for the ground commander to briefly give the attack helicopter team leader any special considerations that may influence his selection of a method of attack.

- Ground units should be prepared to mark their positions in the field. Panels, smoke, and in heavy jungle, flares should be carried by advance units.
- Attack helicopters are not usually well used when called on to furnish blocking fires. Artillery can do this job better.
- Attack helicopters can effectively screen large areas of semi-open terrain and are best employed screening when given firing clearance in advance, if the rules of engagement permit.
- Troops on the ground may be aware of enemy fires being delivered at attack helicopter teams. If the team does not return fire or avoid the area the ground unit should advise the helicopters of this fire.
- Ground troops should make fire adjustments of attack helicopter fires for maximum effect.
- Troops should be informed of possible falling brass and rocket caps and the low angle of attack often used with rockets when attack helicopters are supporting.

Why so late with these tips? Why didn't one of the early UTT team leaders get this down in writing? So often we assimilate skills or knowledge without being fully aware of it. Attack helicopter team leaders do attempt to pass on these tips and literally hundreds of other techniques and tips to their successors. At least the newly trained attack helicopter pilots shouldn't all be able to exclaim — "Now you tell me — six months into my tour in Vietnam."

Above: Troops of the 9th Infantry Division advance on a suspected enemy hiding place near Long Binh in Vietnam. These units are prepared to mark their positions with panels, smoke, or flares. The soldier below is able to coordinate and help direct simultaneous attacks by such fire support elements as artillery, TAC air, and attack helicopters

759

All aviators' flight records must be transcribed to new forms effective with the beginning of the current fiscal year. The new form reflects type and extent of experience much more specifically

EFFECTIVE 1 July 1968 new DA Forms 759 and 759-1 were to be placed in use, with the previous, single-sheet 759 becoming obsolete as of that date. Indications are, however, that some organizations still are using the old form.

AR 95-64, dated 23 February 1968, specifies that all operations personnel charged with maintaining aviators' flight records must transcribe the entries to the new forms effective the beginning of the current fiscal year. This means every hour an aviator has flown during his career should be updated to the new forms as soon as possible.

Generally speaking the new 759 is more comprehensive than the previous edition. Since it breaks down flight hours into additional categories, it allows the aviator and records administrator to be more specific as to the type and extent of experience.

The new 759 has a column for logging aircraft commander time in addition to the old categories of "instructor pilot," "first pilot," "co-pilot," "military student pilot," "foreign military pilot" and "civilian pilot." The method of logging combat time is the same on the new form as it previously was.

Fixed wing time on the new form is broken down into three categories: "single engine," "multi-engine reciprocating" and "multi-engine turboprop." Rotary wing experience is divided into four general types. They are "single engine, single rotor;" "single engine, tandem rotor;" "multi-engine, single rotor;" and "multi-engine, tandem rotor." There also is a column for *"other"* experience.

As was the case with the previous 759, the new form has space for logging synthetic instrument trainer time, type aircraft in which the aviator is qualified and monthly flight hours accrued.

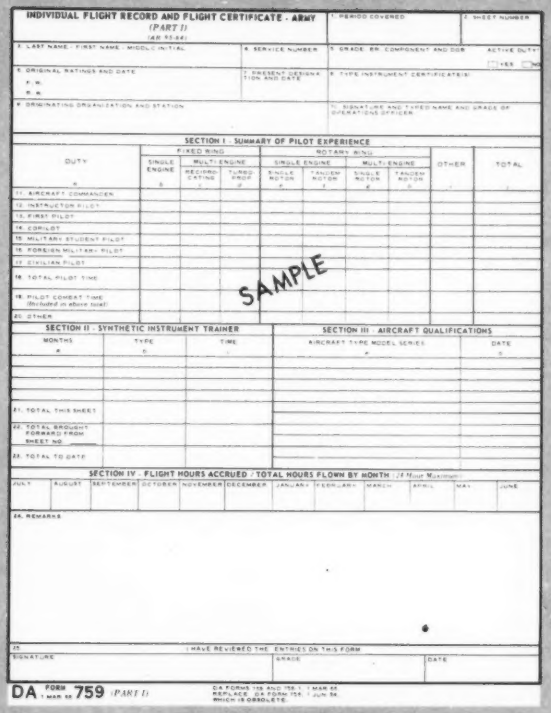
The 759-1 serves as a worksheet for filling out the form. It represents the same data as was previously logged in Section I of the 759. However, here too the experience has been broken down into a more specific format. Under a general category of "first pilot" flying time are columns for "aircraft commander," "instructor pilot" and "first pilot." Then, under subgroupings of "fixed wing" or "rotary wing" are day and night weather instrument, VFR and hood columns. There no longer is a column for recording the number of landings made.

A second major heading for "co-pilots" is broken down in a similar manner and at the extreme right is a column for "cross country" flights. There also is a duplicate monthly accrual section for optional local use.

Instructions for filling out the form are included in AR 95-64. Also, the U. S. Army Aviation School's Department of Publications and Non-Resident Instruction covers how to complete the form in a section of a new correspondence course — Lesson Five of Aviation Subcourse Nine, "Administration and Logging of Flight Time."

A highlight of the lesson is the inclusion of a blank form(s) to be filled out by the student. A typical situation with which the student may be confronted is given and after completion of the form it can be checked for accuracy and proper procedure.

Blank DA Forms 759 and 759-1 and pertinent regulations may be obtained through local Adjutant General Publications Centers. The new subcourse is now available. Personnel interested in obtaining the course may apply to the Commandant, U. S. Army Aviation School, ATTN: AASPI, Fort Rucker, Alabama 36360.


INDIVIDUAL FLIGHT RECORD AND FLIGHT CERTIFICATE - ARMY (PART I) (AR 95-64)

SECTION I - SUMMARY OF PILOT EXPERIENCE

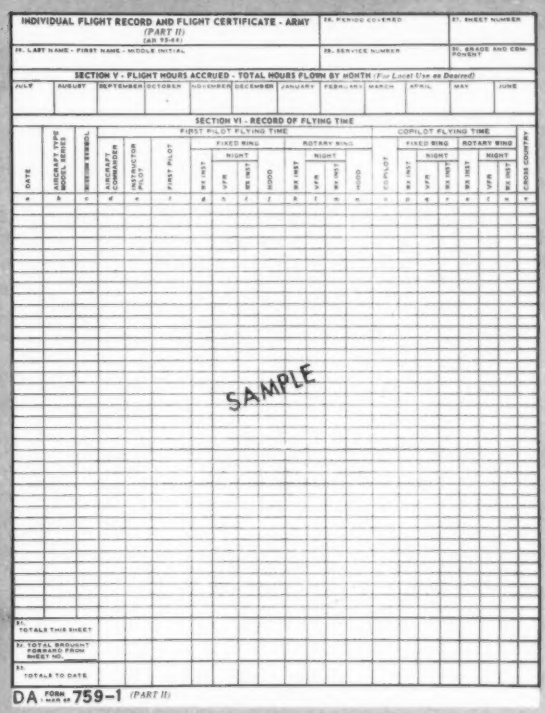
SECTION II - SYNTHETIC INSTRUMENT TRAINER

SECTION III - AIRCRAFT QUALIFICATIONS

SECTION IV - FLIGHT HOURS ACCRUED / TOTAL HOURS FLOWN BY MONTH

SAMPLE

DA FORM 759 (PART I)


INDIVIDUAL FLIGHT RECORD AND FLIGHT CERTIFICATE - ARMY (PART II) (AR 95-64)

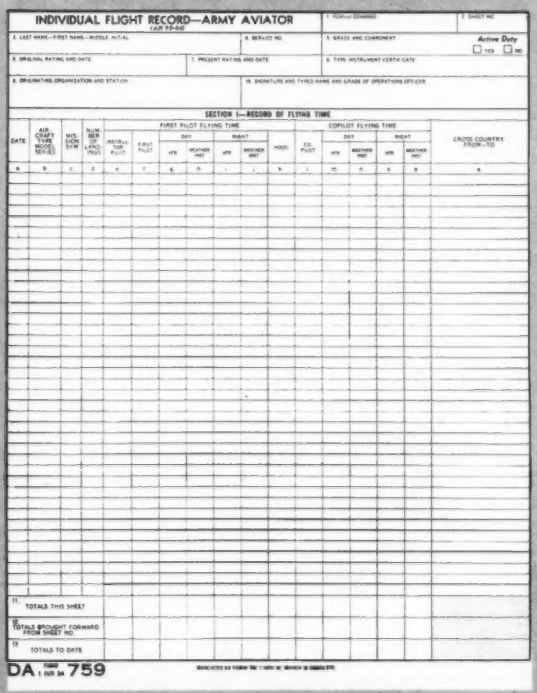
SECTION V - FLIGHT HOURS ACCRUED - TOTAL HOURS FLOWN BY MONTH (For Local Use as Desired)

SECTION VI - RECORD OF FLYING TIME

SAMPLE

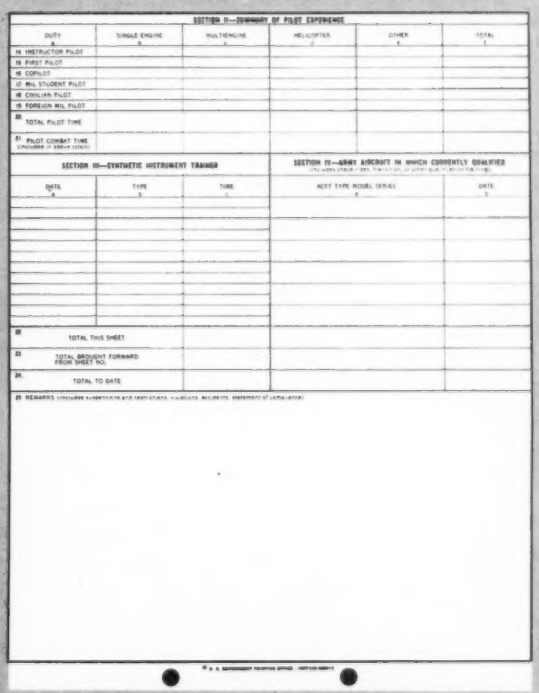
DA FORM 759-1 (PART II)

Above: Parts I and II of the new forms. Below: front and flip sides of old forms


INDIVIDUAL FLIGHT RECORD—ARMY AVIATOR (AR 95-64)

SECTION I—RECORD OF FLYING TIME

DA FORM 759


SECTION II—SUMMARY OF PILOT EXPERIENCE

SECTION III—SYNTHETIC INSTRUMENT TRAINER

SECTION IV—ARMY AIRCRAFT IN WHICH CURRENTLY QUALIFIED

Evolution of the Armed

The U. S. Army's armed helicopter program began to develop in June 1956 when BG Carl I. Hutton assigned a special project to COL Jay D. Vanderpool at Ft Rucker, Ala. Since then, the Army has taken the lead in the development of airmobile operations and armed helicopters. Its initiative has resulted in the airmobile divisions which are being so successfully employed in Vietnam and in the forthcoming debut of the AH-56 Cheyenne which is featured on this month's cover

Major Bill G. Lockwood

TODAY WE CHEER and marvel at the tremendous firepower demonstrated by armed helicopters, and rightfully so. Yet the real potential may well still lie somewhere in the future, as we have barely scratched the surface of its armament capabilities.

Just 17 years ago, in March 1951, General Mark Clark expressed an interest in arming Army aircraft for specific missions. As a result, he initiated project AC-951. However, even as recently as that, many believed that the helicopter was too unstable to be a suitable weapons platform. Long before the project was completed, armed Army aircraft became a high-level policy issue. The Army dropped the project until 1954 when it was revived under the title of "Able Buster" at Camp Rucker, Ala.

Nothing had been done about the using of the helicopter as a weapons platform until 1951, when the U. S. Marine Corps conducted specific testing along these lines.

The French army, fighting guer -

The Aerial Combat Reconnaissance Company at Ft Rucker experimented with hundreds of combinations of armament and helicopters in the late 50s and early 60s. For example, an OH-13 (left) fires an SS-10 wire-guided missile in the early 50s. Later, 2.75 inch rockets are test fired from the UH-19 (above)

d Helicopter

The 1960s brought the emergence of hostilities in Vietnam and the development of more effective armed helicopters. At left, a UH-1B Huey armed with 2.75 inch rockets and machineguns is on a firing run at Ft Rucker. Above, the AH-1G HueyCobra unleashes 2.75 inch rockets on a test run

rilla-tvpe warfare in North Africa in the mid-50s was probably the first to use armed rotary wing aircraft with any degree of success. They armed the Alouette II with the SS-11 rockets and the C-1 (OH-1) with dual machineguns.

As a result of France's success, the Vertol Division of Boeing Aircraft Corporation invited a French lieutenant colonel (Marcel Crespin) to the United States to discuss his operations in Algeria. He reported that of the 130 UH-19 and CH-21 helicopters used, 105 were hit by rifle or automatic weapons fire. However, he said, only two were crashed beyond repair.

Vertol then sent its European representative to gather more information from the French. He found that French pilots had discarded contour flying in favor of high altitudes to eliminate the hazards of ground fire. Also, the enemy lacked tracking devices such as radar. The pilots reported they were seldom exposed to fire larger than .30 caliber.

The French had determined that the rocket, by its instantaneous firepower, was a most effective weapon. It did have its drawbacks, including weight and lack of fire autonomy. The machinegun, on the other hand, lacked the power of the rocket but was light, of little bulk, and could deliver prolonged bursts of high-velocity firepower. Most important, the machinegun was readily available.

Meanwhile, the U. S. Army also was experimenting and introduced the "Sky Cavalry" during exercise Sage Brush in 1955. The Sky Cavalry concept was to impose a light transport helicopter company on the armored reconnaissance battalion of the armored division. It was basically a ground unit assignment with aircraft to facilitate its mission, providing observation, some mobility and battle area surveillance. But no attempt was made then to arm the helicopters.

The U. S. Army's armed helicopter actually began to develop in June 1956 when Brigadier General Carl I. Hutton, the commanding general at Fort Rucker, assigned a special project to Colonel Jay D. Vanderpool. As a result, the Army approved activation of the 7292nd Aerial Combat Reconnassiance Company (Experimental) at Fort Rucker. This company was designed to be completely airmobile, airmounted, fast moving, hard hitting, provide a means of searching out and fixing the enemy and incorporate the traditional mission of cavalry at an accelerated rate.

The ACR company experimented with arming helicopters with .30 and .50 caliber machineguns and with rockets ranging from the 1.5" NAKA to the 5" HVAR. The UH-19 was equipped with thirty 2" folding fin aerial

rockets. The CH-34 had 132 1.5" NAKA rockets and the CH-21 had a combination of machineguns and eight 80 mm rockets or 14 2.75" rockets. Mounts for these weapons systems were improvised and hand-designed. The sights and alignments also were rather primitive.

While the United States was experimenting with the ACR company, the Soviets also were developing armed helicopters. They used one of their own surface to surface missiles mounted on the M-4 Hound, the Harp, and other Russian helicopters. They also were equipping the M-4 with a 37 mm gun.

The German army began using the French Alouette II armed with the SS-11 missiles, and the U. S. Army mounted the SS-11 on the OH-13 and, later, on the Hueys.

In 1960 the U. S. Marine Corps fired a Bullpup missile from a HUS-1 (the Army's CH-34). The missile was 12½ feet long and weighed 570 pounds. It was the largest and first radio controlled missile ever fired from a helicopter.

During the latter part of 1961 the United States deployed its first helicopters to Vietnam. The first were CH-21s used primarily for cargo and troop transport. They did, however, mount .30 caliber machineguns in the doors, and some were even equipped with flexible gun kits similar to those mounted on the Hueys.

Next came the now famous Utility Tactical Transport Company. This company, commonly called the UTT, was activated 25 July 1962 at Okinawa under the command of then Major Robert L. Runkle. Its primary mission was to transport troops into the battle zone. However, it was soon to acquire a more unique mission.

Due to increasing combat damage to CH-21s in Vietnam, in October 1962 the UTT was assigned to Vietnam to provide armed escort for the CH-21s. This

The French used armed helicopters effectively combating guerrillas in the mid-50s in North Africa. One of the most notable of the French armed helicopters was the Alouette, armed above with 37 mm rockets. One container of rockets was mounted on each side of the helicopter. The French also armed the CH-21 — below with 68 mm rockets and a machinegun by the forward gear

company was equipped with UH-1As armed with M-60 machineguns. They were nonflexing and mounted on the side of the aircraft. Within a month the unit had demonstrated its value and was receiving B model Hueys equipped with the M-6 flexible machinegun system. Later, rockets were added to the system.

Eventually the UTT was redesignated the 68th Aviation Company, later the 197th Aviation Company, and now the 334th Aviation Company (Escort). On 26 April 1965 it became the first Army unit in Vietnam to receive the Distinguished Unit Citation by the President of the United States. It was awarded for action at Duc Hoa 1-3 April 1965.

Armed helicopters in combat resulted in new tactics used in the employment of new weapons. Also, new jargon was appearing in the aviators' language, such as "light

fire team," "heavy fire team," "eagle flight" and "clover leaf attack."

During this time, Army aviation had many well qualified helicopter pilots, but practically none were experienced with armed ships. The armament system was issued to the airmobile company commander and it was his responsibility to train the aviators.

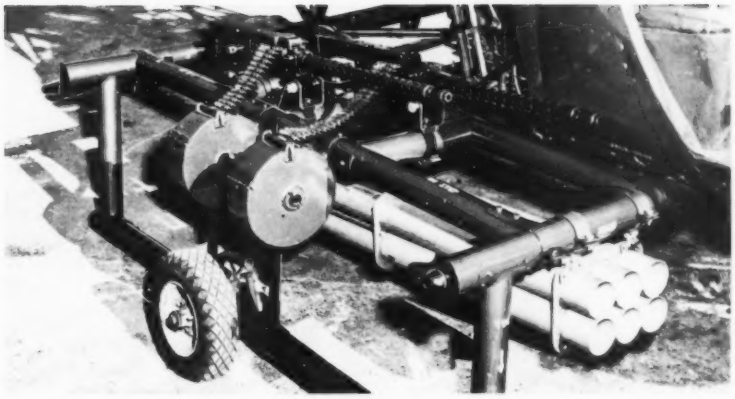
These aviators had no previous armament experience, but they did have initiative and a will to do the best possible job. They learned the functioning of their weapon systems, developed new tactics and accomplished their missions in an outstanding manner. But this took time and it was costly in the combat zone, since the only teacher was trial and error.

This problem continues to exist today. By the time aviators have learned their weapon system, the tactics of employing armed helicopters, and have developed their firing accuracy to a fine art, they are about due to be rotated back to the United States. They probably report to an assignment that requires no armed helicopter experience. Thus the entire retraining cycle must be repeated over and over again.

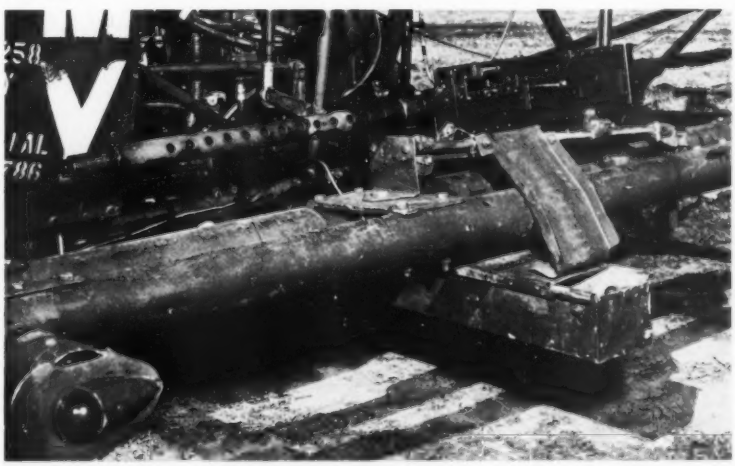
Perhaps a solution to this problem would be to identify these experienced armed-helicopter aviators by specific MOS. When we consider the use of helicopters specifically designed to be armed, such as the AH-1G HueyCobra and the AH-56 Cheyenne, we can see a need for identifying experienced armed-helicopter aviators.

These trained armed-helicopter aviators must be retained in this field to limit costly specialized training of aviators who lack armed experience.

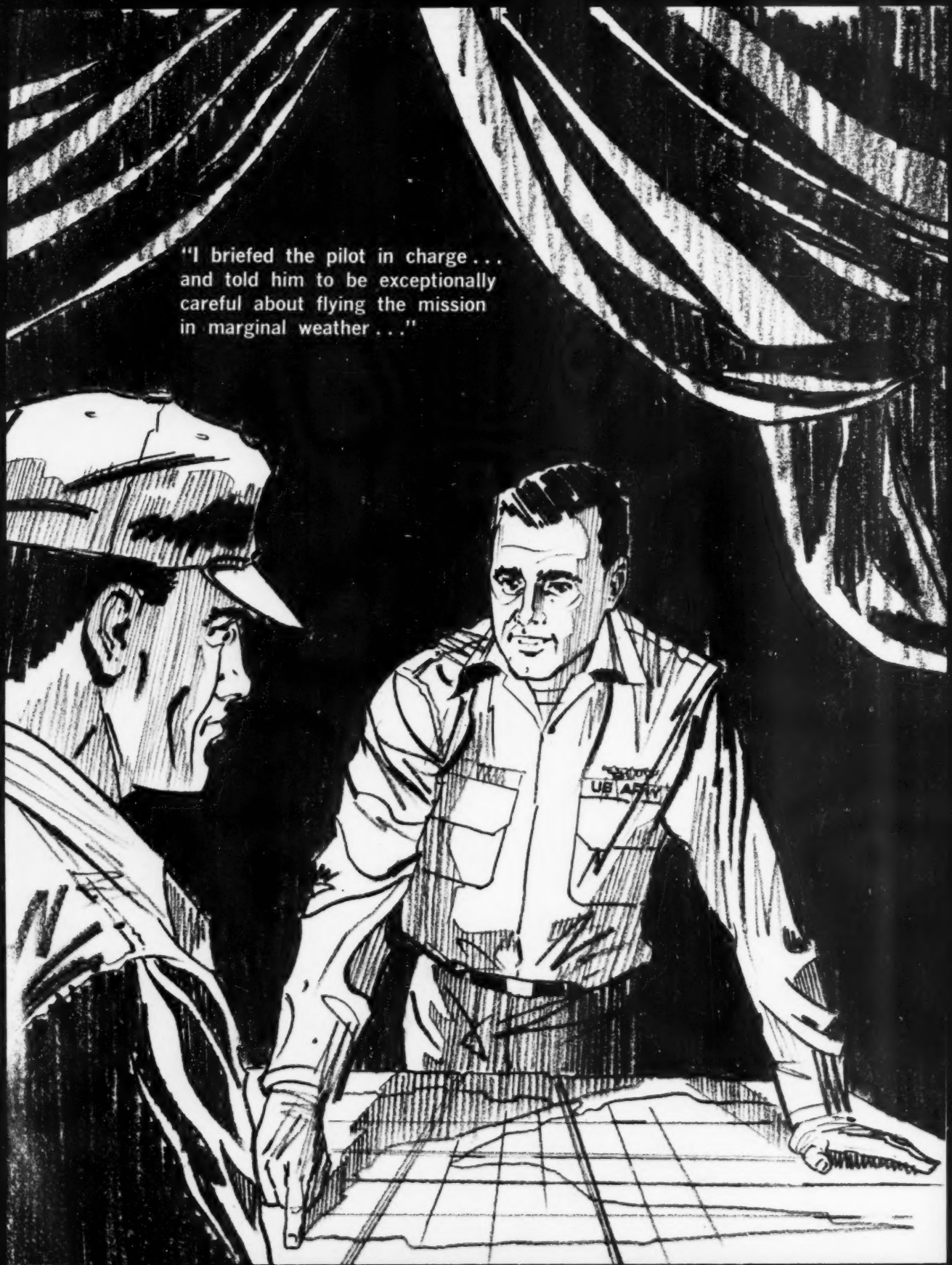
Looking back to past achievements in the aviation field, one can see that Army aviation is merely on the threshold of advancement in the armed helicopter field.



Above: An Aerial Combat Reconnaissance Company helicopter armament experiment with the OH-13 included aerial .30 caliber machineguns and 2.75 inch rockets. This was an uncushioned mount. Below, the same machinegun is installed on a cushioned mount



The fore runner of the M-2 kit (below) appeared in the early 60s. It was streamlined, lightened (made of aluminum) and featured cockpit elevation and depression controls. For more information on early ACR gun kits see the May 1960 DIGEST


"I briefed the pilot in charge . . . and told him to be exceptionally careful about flying the mission in marginal weather . . ."

MARGINAL MISSION

PLATOON LEADER: "I received the mission from operations at approximately 1600. Initially, I was going to assign it to another pilot in my platoon, but I found he had flown more than 5 hours. I asked the rest of my platoon about the number of hours they had flown during the day and chose a pilot who had flown less than 3 hours. There was no doubt in my mind that he could handle the mission. He had been acting in the capacity of pilot in charge since his arrival, and had operated in and out of the LZ constantly . . . In addition, he had flown flare missions on at least three previous occasions and was experienced in the various details of the mission.

"I then chose another pilot who, although new, was exceptionally strong as a pilot to be his copilot. After choosing the crew, I took the pilot in charge aside and personally briefed him on the mission. This briefing was prompted by the experience of another of my pilots. On the previous night, he had been sent out on a flare mission in marginal weather. He was able to partially complete the mission, but, while returning to the LZ, he went IFR. He had vertigo and zeroed his airspeed before handing the aircraft over to his copilot who put it in a normal attitude. After they landed, I sent the pilot for 2 days' rest, as he was visibly shaken.

"I briefed the pilot in charge about the incident of the night before and told him to be exceptionally careful about flying the mission in marginal weather. I also told him if there was any doubt about the mission or the weather, that he should refuse to fly it and that I would back him up if anything was said. He told me he would follow my instructions."

"Was the ranking aviator assigned the responsibility to monitor the operation of aircraft on standby at the LZ?"

"The flare ship, command and control, and armed helicopters operated independently."

Gunship commander: "At approximately 0430, we received a call requesting the flare ship and two gunships to go to the vicinity of another LZ. About 0445, I had the two gunships waiting for takeoff. I called the pilot of the UH-1H flare ship and asked him to drop a couple of flares up the valley for us. He rogered, lifted off to a northerly heading, and started a left turn, passing over me at approximately 100 feet. I tried to contact him several times on FM and UHF, with no success. I saw a fire to the southeast . . . About 10 seconds later, I heard a call which said the flare ship had crashed just outside the perimeter. We shut down and got to the crash site. The helicopter was completely engulfed in flames, except for the tail boom. The flares and small arms were exploding and we could not get near it.

"I would say it was 8-10 minutes after we first saw the flames before we got to the site. Also, after I had first talked with the pilot of the flare ship — about a minute or two — I heard a statement over the UHF which was either 'I've got it' or 'You've got it.' The weather was marginal with a ragged ceiling, mist, and low visibility . . . ."

MARGINAL MISSION

"What is your definition of marginal weather?"

"Marginal weather is weather in which it is debatable whether one can complete the mission. An inflight evaluation may be necessary before the final decision can be made."

"What were your estimates of visibility, ceiling, and mist conditions?"

"Visibility at ground level was approximately ¾-1 mile. The ceiling appeared to be around 500 feet. There had been a slight drizzle, but by takeoff time it changed to a fine mist."

"Explain what you mean by the term ragged ceiling."

"The ceiling was variable. It appeared to be lower to the southwest, but it was too dark to see the outline of the hills to the south."

"What weather minimums were outlined by your company for use by the standby crews at the LZ?"

"The decision to fly or not fly because of weather was left to the individual aircraft commander's judgment, with the exception of the armed helicopter section which had a section commander who controlled the two aircraft."

"Were you delegated the responsibility to monitor the operation of the other aircraft on standby duty?"

"The flare ship, command and control, and armed helicopters were from different platoons and were assigned missions independently. I made recommendations to the crews on occasion, but I was hesitant to step in too often as the crews belonged to another platoon and were not placed under my operational control."

Witness: "At 0455 I was on guard when a helicopter took off from the LZ chopper pad. It came over my bunker position at approximately 100 feet and traveled 100 meters outside the defense wire. At that point, it started a rapid descent, turning to the right until it was headed back in the opposite direction. Just after it completed the turn, it struck the ground and bounced back up about 15 feet in the air. It appeared to me that the tail rotor was damaged in the bounce, as the helicopter started spinning around and around. After about 50 meters, it suddenly tipped up on edge and crashed. I radioed in immediately and about that time the ammo in the chopper started going off. The man in the next bunker proceeded to it as soon as possible."

Narrative: ". . . personnel on guard saw the helicopter make a rapid descending turn to the right and roll out on a heading toward the compound. A radio transmission was heard, in which a panicky voice said 'I've got it' or 'You've got it.' The aircraft hit the ground, rose several feet, spun around two times, and proceeded toward the east. It then tilted on its side and the main rotor blades struck the ground, separating along with the hub assembly. The aircraft nose hit, causing radio components, battery, and plexiglas to be spread over the ground. When the final impact occurred, 125 meters east of initial ground contact, the helicopter caught fire immediately, killing all occupants. The load of flares and basic load of ammunition contributed to the conflagration.

It could not be determined which aviator was at the controls. A radio transmission was heard, in which a panicky voice said 'I've got it' or 'You've got it'. When the final impact occurred, the helicopter caught fire immediately, killing all occupants

"At the point of initial ground contact, the helicopter appeared to be under control with the exception of a high rate of descent. The imprints on the ground were straight and the skids were parallel with the direction of landing . . .

"It could not be determined which aviator was at the controls during any period of the flight. It is apparent there was a transfer of flight controls from one to the other immediately prior to the crash. This was evidenced by the radio call that was heard . . .

"The reason the helicopter made a descending turn to the right and was flown toward the compound could not be positively determined. The board put together the known facts, but could only reason and attempt reconstruction of the series of events that caused the crash. Mechanical failure could not be eliminated because detailed examination of mechanical parts was impossible due to near total destruction by fire. The main rotor hit the ground at a near perpendicular angle and, judging from the shear stresses, operational rpm had been maintained until the rotor strike occurred. As stated, the imprints on initial contact indicated the helicopter hit reasonably

level and parallel to the approach heading. Judging from the distance and a 90° change in direction of flight path between initial contact and final ground contact, the engine had to be functioning and operational rpm maintained until the main rotor hit . . .

"The existing weather conditions at the time of the accident may have caused the aviators to attempt to abort the takeoff . . . Weather conditions at the accident site can only be estimated. Aviator estimates ranged from 150-200 foot ceilings, ¼-mile visibility, light rain and drizzle to 500 feet and 1-mile visibility, with mist.

"Inadvertently flying into IFR weather may have caused the aviators to attempt to make a 180° turn and return to their takeoff point. The inability of the aviators to transition rapidly from VFR to IFR and back again to VFR flight conditions may have contributed.

"A letter of instructions on flare ship operations from the parent unit commander stated that the flare ship should be operated at 2,700 feet above ground level to be most effective. It stated that the flares are effective as low as 2,000 feet and that the minimum ceiling for flare operation was 2,300 feet. This letter was not being followed by the aviators within the unit. At the time of the accident, the unit SOP had not been published. An instance previous to this accident is indicative of the weather minimums observed by the company—"

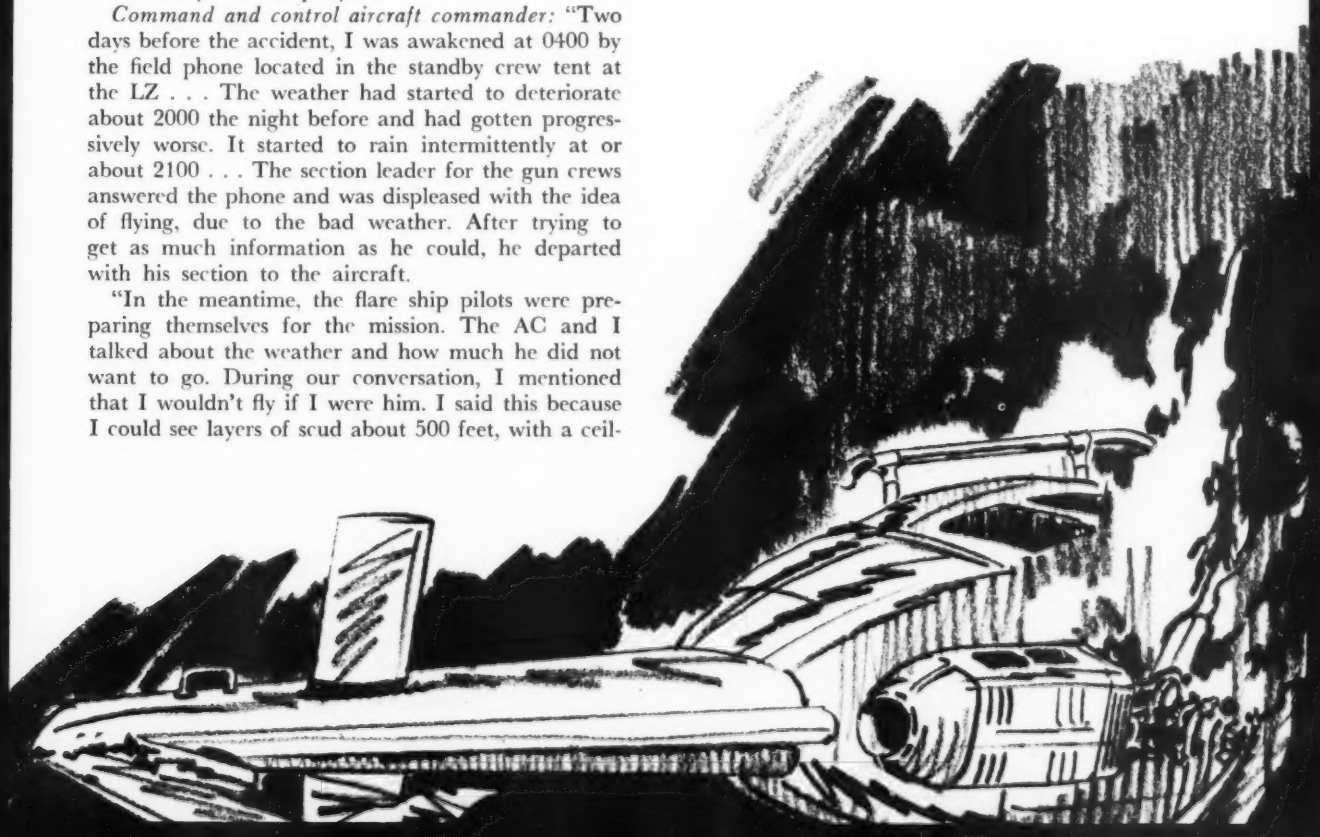
Command and control aircraft commander: "Two days before the accident, I was awakened at 0400 by the field phone located in the standby crew tent at the LZ . . . The weather had started to deteriorate about 2000 the night before and had gotten progressively worse. It started to rain intermittently at or about 2100 . . . The section leader for the gun crews answered the phone and was displeased with the idea of flying, due to the bad weather. After trying to get as much information as he could, he departed with his section to the aircraft.

"In the meantime, the flare ship pilots were preparing themselves for the mission. The AC and I talked about the weather and how much he did not want to go. During our conversation, I mentioned that I wouldn't fly if I were him. I said this because I could see layers of scud about 500 feet, with a ceiling of approximately 1,000 feet. In a short time, the phone rang again and I was told to prepare for flight. Reluctantly, my crew and I went to the aircraft . . . We flat didn't want to go because of the weather.

"One of the ground commander passengers approached me and asked if I was ready. My exact words to him were 'Sir, I don't think we ought to go. The weather is bad.' He said 'Go ahead and crank her up.' We started the aircraft and went through the normal checks while the three ground commander passengers climbed aboard.

"There was no horizon and there was light rain. We picked up and departed to the north. On climbout, I started to experience disorientation and was worrying about the mountains in front of us. I turned to the west to avoid the mountains. My copilot was using the searchlight and had his head out of the window, trying to see where we were going. As we turned to the west, we were about 300-400 feet and I was trying to get myself oriented by looking at the only definable light at the LZ, a rotating beacon mounted about 10 feet from the ground. The one light was not enough for me to gain orientation.

"Off to the south, I could see mortar flares and



became somewhat oriented. While turning to the south, I could see we would be in the clouds if we kept climbing. I went down on the collective and started worrying about the mountain just south of the LZ. I told my copilot to turn off the searchlight because it was blinding me. Seconds later, I asked him to turn it on again and see if he could find the ground, mainly the mountain to the south. We found it and we were too close to it. I turned to the north, looking for the beacon. At this time, I had a touch of vertigo and decided to try and get the aircraft back on the ground. I was having trouble keeping it under control.

"By keeping his head outside, my copilot found the ground and became oriented. He directed me toward the beacon. I started my approach, but came in too fast and too high. The beacon did not provide enough light for me to identify the landing area. I made a go-around and landed on the second attempt . . .

"The flare ship came in after us and had pretty much the same kind of story as we did, except they had climbed to 3,000 feet and experienced bad cases of vertigo and disorientation. But they managed to get back on the ground."

Narrative: "Several areas of supervisory factors should be considered. The weather conditions and aircraft limitations were not fully analyzed by all ground commanders. Other means were available to accomplish the mission. The valley was narrow and, coupled with darkness, low ceilings, and low visibility, the effectiveness of armed helicopters was very limited and their use exceeded a calculated risk.

"Illumination during periods of low visibility is most effectively accomplished by artillery or by another service which has the capability of dropping flares during IFR flight conditions.

"The area of aviation command supervision should also be analyzed. It is evident that it was common practice to fly during periods of marginal weather with no set minimums. It was stated that the two armed helicopters were going to become airborne as soon as the helicopter that crashed had dropped some flares. Statements also pointed out that the ranking Army aviator was not placed in command of all personnel assigned standby duties. This was a problem area in that three separate platoons furnished aircraft to support the standby mission. Individual aircraft commanders were controlled by the supported unit commander . . . ."

Analysis: "The accident appears to have been caused by the aviators attempting to fly in marginal weather at night beyond their capabilities. . . . both were highly regarded by their superiors and contemporaries, and were considered competent officers and above average aviators. They got along with each other well and there was no evidence of personal problems.

"Investigation revealed that neither aviator was an aircraft commander. This was due to a shortage of aircraft commanders within the platoon. The platoon leader selected his most experienced and most rested aviators for the mission and appointed one as the pilot in command. Both aviators had been on duty for approximately 21 hours. However, they retired at a reasonable hour and remained in bed for at least 5½ hours prior to the accident. The board believes that the long hours of continuous duty and the high number of flying hours (101 hours for one and 133.3 hours for the other) during the last 30-day period, coupled with field living conditions, may have resulted in fatigue. The inability to effectively evaluate the mission resulted from fatigue, inexperience, and a lack of on-site aviation supervision. The board believes that on-site aviation supervision was a contributing factor. The ranking Army aviator should have been made responsible for controlling the four aircraft separated from company operations. This would have taken some pressure from lower ranking, more inexperienced aviators who tend to be imbued with mission accomplishment and fail to properly evaluate missions before becoming airborne. This would also close the gap in rank between the aviation unit and the supported unit.

"Flying in adverse weather conditions received command emphasis the night before in a safety meeting. However, the personnel involved in this accident did not attend. The platoon leader gave the pilot in command special instructions during the mission briefing and told him not to take any chances during marginal weather. The mission requirement of the unit is such that it is extremely difficult for the unit to maintain a training program for aircraft commanders."

Cause factors: "Failure of pilot in command to fully evaluate the situation and his capabilities prior to flying in marginal weather during darkness.

"Failure to remain oriented while trying to abort the flight into IFR conditions . . .

"Supervision — helicopters were employed when weather conditions severely restricted their capabilities to deliver effective fire support and illumination. The use of helicopters under the existing conditions of weather in mountainous terrain exceeded a calculated risk."

Recommendations: "That this accident be publicized . . . to ensure aviator awareness of the cause factors listed.

"That aviators be made aware of their responsibilities to evaluate the situation and mission when taking command of Army aircraft.

"That tactical ground commanders be continually informed of aviation SOPs and doctrine which govern the use of helicopters. . . ."

Indorsement: ". . . An additional finding in this accident is supervisory error on the part of the pilot in command. He should have recognized the hazardous conditions that existed and informed the supported unit that the mission should not have been flown.

". . . command has experienced many losses because aircraft commanders and pilots have failed to react correctly to inadvertent actual instrument conditions. The decision to attempt to remain VFR is almost always fatal. The aviator graduates of the U.S. Army Aviation School are competent in instrument flight. However, additional emphasis must be placed on the immediate reaction to inadvertent actual instrument conditions to ensure a correct reaction.

"Further recommend that all aviators . . . be made aware of the importance of knowing their capabilities and limitations. All commanders are reminded that adherence to normal mission parameters is a must. Every effort will be made to avoid marginal operations when the risk involved does not warrant the potential losses. This mission was attempted even though there was very little chance of success."

MARGINAL FLYING

. . . the pilot could not cope with whatever occurred or he did not recognize its seriousness until too late to recover

ACCIDENT NUMBER 1

INVESTIGATION NARRATIVE: "One witness saw the U-6A descending toward the water. He was unable to see it strike the water because of a tree line . . . He was working on his boat and heard what he thought was an aircraft engine revving up. Another man nearby called for him to look up. As he did, he saw what appeared to be a wing coming off the fuselage as the aircraft was descending. The other wing was already off. The aircraft was in a right spiral and was about six-tenths of a mile off shore.

"Another man working on a boat saw the aircraft descending, or what he called 'pinwheeling.' One wing was trailing down behind the aircraft and the other was still attached. Then he saw that wing come off. The weather was misty, raining, and foggy — lower than usual. He didn't see the plane strike the water but thought he heard a small explosion . . .

"Another witness heard a noise that sounded like an aircraft engine accelerating in a dive. About 25 seconds later he saw the aircraft in a shallow dive among the clouds. It went behind another cloud, came out in a dive, and then he heard a screeching, grinding noise as it emerged. The plane was in a right turn. He estimated the wings landed in the water approximately 100 yards from the plane. He also said he saw a piece of metal about 4 feet wide and the size of a car falling behind the plane. This witness was about 600-1,000 yards southeast of the crash site.

"Another witness was in a boat approxiately 300 yards from where the plane struck the water. He first heard a noise that sounded like a 'hard strain' and he also said he heard the motor sputter and die. The aircraft was spinning in one piece, according to this witness. He saw no parts fall from the plane. It struck the water, went under, and there was a muffled ex-

after the wings came off the aircraft, the main portion of the fuselage came straight down with a rotating motion to the right . . .

plosion. He went to the crash site and found various articles of debris floating in the water . . .

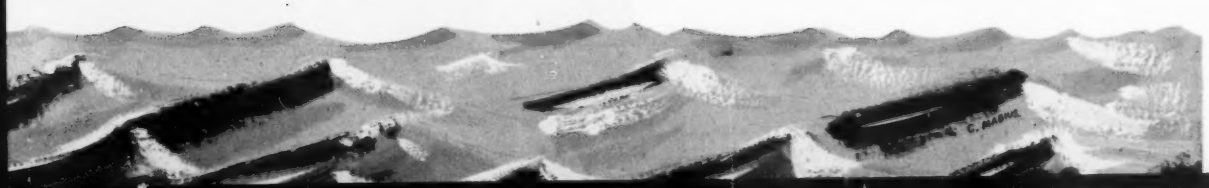
"Another witness was alone in a small boat. He first heard noises like an engine revving up. When he looked up, he saw three or four pieces coming down. He said the part that had the motor attached was twisting around and coming down real fast. There was a time interval from when he first heard the noise to when he saw the plane falling . . . ."

The pilot, copilot, and three passengers were killed as a result of extreme deceleration forces.

Analysis: "Indications were that the flight was normal up to the last positive radar contact. Due to unknown reasons, the aircraft assumed an abnormal attitude and crashed in the river.

"Witnesses reported that their attention was called to the aircraft, even before they could see it, by an extremely loud noise from the engine. The engine failed as a result of an overspeed. Although not necessarily significant, the reason for the overspeed was the fact that the stop on the propeller governor was bent so that it did not operate properly. The engine normally governs at a maximum rpm of 2650. This defect allowed the engine to reach 2850 rpm. The initial sighting of the aircraft by witnesses was as it came out of the overcast, variable from 400 to 600 feet agl. There was some disagreement among the witnesses about the exact attitude and flight path. Generally, they agreed that the wings came off at the approximate time the aircraft came out of the clouds. In fact, some witnesses said they heard and saw the wings leave. After the wings parted, the main portion of the fuselage came straight down with a rotating motion to the right. References by witnesses to an explosion were attributed to the sound the aircraft made as it struck the water at an extremely high rate of speed.

"The aircraft entered the water approximately 1,200 yards off shore. All parts were recovered except the left wing and the outboard two-thirds of the left elevator. All parts were found within a radius of 200 yards of the main fuselage. The wings were seen to enter the water a short distance northwest, moments after the impact of the fuselage. The wings then floated downriver where the right wing was recovered. The left wing sunk and all efforts to locate it were unsuccessful. Failure to find the left wing was not considered significant, since all wing attaching points were attached to the fuselage, and, during subsequent



analysis, were found to have failed due to forces exceeding the designed stress limits. This was also true of the elevator torque tube attaching points. All metal fractures were of a static overload type, with no indication of progressive fatigue.

"Analysis of the right wing revealed that the wing failed as a result of positive overload . . . Both wing struts appeared to have failed in a similar manner. The wings became separated first, followed by the struts leaving the fuselage with the attaching points intact. The right elevator failed from a rapid rearward movement of the control column. The fracture surfaces of the left elevator indicated the same type of failure . . .

"From takeoff to the time of the accident, approximately 35 minutes elapsed. In subsequent flights by boardmembers in the same type aircraft, it was determined that this would be approximately the position where the fuel in the rear tank would have been exhausted (tip tanks not filled) had the selector not been switched to the middle tank (assuming the normal procedure of draining rear, middle, and front was used). The pilot would have seen a red warning light (later tested and found operational) and a loss of fuel pressure, necessitating a rapid wobble pump application.

". . . The aircraft entered an area of heavy rain. Information contained in the weather report indicated the aircraft was in the clouds during the majority of the flight. From the radar controller's statement, it was estimated the aircraft was in an area of light rain just prior to entering the heavy rain.

". . . In the U-6A, with only one omni receiver, it is difficult to pinpoint a VOR intersection. It is feasible to assume the copilot was performing copilot duties and not necessarily watching the flight attitude.

". . . There was a strong possibility of moderate turbulence in the area of heavy rain which the aircraft entered after turning at the intersection.

"Spatial disorientation, as a result of occurrences while turning to a new course, cannot be ruled out as a possible contributing factor.

"One or more of these, occurring at this critical time in the flight, would have presented a difficult situation to the pilot, particularly in light of his experience level. However, the board cannot positively state that any one or more resulted in the accident.

"The pilot had not flown a U-6A for approximately 40 days. Because of his total fixed wing time, 461 hours, he was not current in the aircraft. However, the copilot was current and could administer a currency ride to the pilot . . .

"The pilot had flown a total of 80 hours in the U-6A since graduation from flight school 3 years before the accident. He had 78 hours of link training and 32 hours of hooded flight. He had a total of 3.5 hours actual instruments as pilot, and 5 hours actual instruments as copilot.

"The copilot had a total of 62.6 hours in the U-6A since graduation from flight school almost 2½ years before the accident. He had 35 hours of link training and 19.5 hours of hooded flight, as well as 2.3 hours of actual instruments as pilot and 1.2 as copilot.

"The experience level of both pilots was considered low. However, they were both instrument qualified and should have been capable of completing the assigned mission.

"The board cannot determine whether the onset of events leading to the accident was rapid or slow. It must be assumed the pilot could not cope with whatever occurred or he did not recognize its seriousness until too late to recover.

"All personnel were wearing parachutes, properly buckled, and no doors were jettisoned from the aircraft prior to impact."

Approving authority: ". . . There was sufficient evidence in the narrative of the investigation to support the addition of 'inadequate supervision of flight operations' as a probable or suspected contributing factor.

"It was noted that the aircraft was over the authorized maximum gross load at the time of takeoff."

ACCIDENT NUMBER 2

UH-1D pilot: "We took off at approximately 1350 to carry three swimmers and their commander to a boat helipad in the river. They were to go aboard small boats and demolish mines in the river.

"We flew to the operational area, contacted the boat helipad, and called for smoke because there were several boats in the area. They popped green smoke and we circled at 1,500 feet. The AC set up his approach to the boat helipad from the southwest.

"During the approach, he asked how fast the boat was traveling. The crew replied 500 rpm, or about 1 mile per hour at most. The approach was good . . .

"Over the helipad, the crewchief, on the right side, thinking his side was not far enough, asked the AC if he could move it forward a little bit. I think he said 3 feet. However, the gunner later said his side was completely over the helipad. The rpm audio warning signal brought my attention back to the cockpit and I looked over and saw we were at 5800 rpm. The AC immediately put it into a right turn and said 'beep it.' I was already beeping it.

"We turned approximately 180° and appeared to be gaining speed. We started into a low right 360 at 3 or 4 feet off the water, and continued until the skids hit the water. The aircraft lunged to the left and went down. There was a mad scramble and I

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thought I felt somebody around my head, arms and legs, as I was taking off my helmet and breastplate.

"I reached back to grab the back of the seat because it was the only thing I felt. It was so muddy I couldn't see a thing. I pulled myself from the seat by grabbing with my right hand on the back of the seat and pulling. I could see a little light area so I started swimming toward it. By the position from which I came up, I would say I came out the right cargo door . . . . "

The pilot, crewchief, gunner, and six passengers survived. The AC did not get out of the aircraft and drowned.

Aircraft accident investigation board analysis: "The AC and pilot had been assigned a general support type mission. There was no apparent briefing about what they would actually be doing . . . During the morning, they flew personnel missions to various locations . . .

"At lunch, the AC was asked to carry swimmers to an LCM boat which had a helicopter landing pad on its bow. This was a change of mission and the board, through interviews, determined that the AC had never made a landing on any type of boat. Further, there was no established unit training to prepare aviators for this type of mission. However, he accepted the mission and in his conversation with the pilot at lunch, he made the comment that he had never done this before.

"It was established that the AC did not conduct a crew or passenger briefing prior to takeoff. It could not be established if he made any computations about aircraft capabilities to accomplish the mission . . .

"Arriving at the site of the LCM, the AC made a left descending orbit. This did not offer the best advantage to make a high recon, since he was flying from the right seat and the aircraft was equipped with a Decca head mounted on top of the instrument panel. The weather report showed the wind from 240° to 320° at 4-8 knots. The AC established a

the aircraft commander accepted mission although he had never made a landing on any type of boat

Wet Huey as it was raised from river bottom

steep approach on an approximate heading of 120°. This decision appeared to have been based on the direction of smoke from the LCM. The LCM was moving on a heading of 180° and the smoke trailed the boat from south to north, concealing the true direction of the wind.

"It was determined that the size and shape of the landing pad and the LCM were too small to offer much ground effect. The landing pad was 10-12 feet above the water. Because of this, the aircraft would be at a 12-14 foot hover. Approximately two-thirds of the rotor disc was over the water. Thus the aircraft was hovering out of ground effect. Through all the interviews, there was never any mention of water spray around the boat and aircraft while it was over the landing pad.

"The basic weight of the aircraft was 5,204.8 pounds. The board computed a weight and balance for the landing configuration at the time of the accident and found it to be 8,619 pounds. Using the outside air temperature of 33° C (88° F) and a pressure altitude of 142 feet and the chart for hovering out of ground effect, page 14-96, chart 14-22, TM 55-1520-210-10, dated December 1965, with change 2, dated 13 June 1966, it was found that the maximum gross weight allowable at 6600 rpm was 8,250 pounds. The aircraft was 369 pounds overweight for its landing on the LCM, if 6600 rpm was used. The AC, however, was using only 6400 rpm for all his takeoffs and landings that day. It was determined through interviews with members of his unit that there was a verbal unit policy which stated all takeoffs, landings, and cruise flight would be conducted at 6400 rpm.

"The low audio rpm signal was heard and the warning light was seen while the aircraft was over the LCM when the engine rpm decayed to 5800. This low rpm condition (6000 or less) in a heavily loaded aircraft creates a situation where full left pedal is required to maintain a straight heading. As the left pedal reaches its full travel, the aircraft will start rotating to the right. This was as described by the

LCM with UH-1 on small helipad

the major cause was the attempt to land in an overgross condition out of ground effect . . .

crew and passengers. As the aircraft started moving off to the right with forward movement and descending toward the water, it began to make slow revolutions to the right about its vertical axis. The pilot stated the AC applied right cyclic in turning to fly off the LCM. It was concluded that this was an attempt to fly out of the situation.

"When it became apparent that the aircraft was going into the water, the crew and passengers, with the exception of the pilot and AC, began making preparations for ditching. The passengers, with the exception of one, were trained underwater divers and swimmers. One of the passengers, who had received a briefing on helicopter water ditching a few days prior, alerted the passengers not to depart the aircraft until the rotor blades had stopped. It was established that no one got out before the rotor blades struck the water. Passengers who departed the aircraft when completely submerged stated they experienced disorientation and were unable to see underwater.

"The crewchief and gunner, who had freed themselves from their seat belts and body armor before entering the water, did not experience any difficulty in exiting. The pilot stated that he was completely submerged before starting to get out of his equipment. He removed his seat belt, helmet, and body armor, which was worn in the vest and secured around his waist . . . The AC had on the same equipment as the pilot, with the exception of a weapon. When the aircraft was recovered, his seat belt was open and the shoulder straps were over the back of the seat. The inertia reel was locked. The armor plate was pushed to the rear and the door handle on the right door was turned part way down . . .

"The board analyzed the effect and result of the governor control by attempting to simulate the low rpm condition. By setting the engine rpm at 6400 and rolling the throttle off, reducing the rpm to 5800, the beep switch was depressed for 10 seconds and no visual change was indicated in the rpm gauge. An inspection showed that the linear actuator did move to the rear or fully extended position. Then, with the same throttle and rpm setting of 5800 rpm, the beep switch was moved to the increase position. The linear actuator moved its full travel forward, but no rpm increase was seen on the tachometer. A third experiment was done by establishing full throttle at 6400 rpm. This time the throttle was rolled back until an rpm of 6200 was established. Once again, the beep switch was activated in both positions and an increase and decrease of rpm were seen on the tachometer.

"It was concluded that the position of the linear actuator would not have had any effect on the engine rpm, as it had no effect on the governor after the rpm decayed below 6000. It would have been impossible to come to a momentary hover over the LCM in a heavily loaded UH-1D if the rpm had been fully decreased during the approach. At some point during the time the aircraft left the LCM and the battery failed from submersion, the switch was depressed.

"The major cause was the attempt to land in an overgross condition out of ground effect.

"Contributing factors were:

"Supervisory: It was company policy to use 6400 rpm for all flight conditions, thus depriving pilots of the use of full power.

"The attempt to land downwind, which further decreased aircraft performance.

"The movement of the boat made the final portion of the approach more difficult, possibly accounting for the fact that the right skid was not directly over the landing pad at termination.

"No training for this type of landing on LCM boats had been conducted. The AC accepted the mission knowing that he had never done this before."

OVERWATER ADVISORY

WHILE ON the subject of water accidents, following is some excellent advice from the U. S. Navy contained in an interim change to its UH-2C flight manual:

Hovering over salt water — Salt spray ingestion in the engine will result in a loss in performance, as well as a loss in compressor stall margin. This reduction in stall margin makes the engine susceptible to stalls, particularly during decelerations. As spray is ingested and strikes the compressor blades and stator vanes, salt is deposited. The resulting buildup gradually changes the airfoil sections, which in turn affects performance. This deterioration will be noticed as an increase in T5 (turbine inlet temperature) for a given torque. Should the deterioration reach a point where the compressor actually stalls, a muffled explosive sound will be heard, T5 will rapidly overtemp, while N_2 and torque decrease rapidly.

Although these salt encrustation-type stalls generally occur during conditions of N_2 deceleration, compressor surges can occur at steady state power or during acceleration. A surge (partial stall) is characterized by one or more muffled but discernible explosions or pops, without attendant loss of T5 or power. Natural pilot reaction is to immediately lower collective following a noise of this type; however, as deceleration precipitates the stall, the most beneficial pilot action would be to hesitate momentarily. If only a surge has occurred, chances are good that power will be retained as long as the engine or engines are not decelerated.

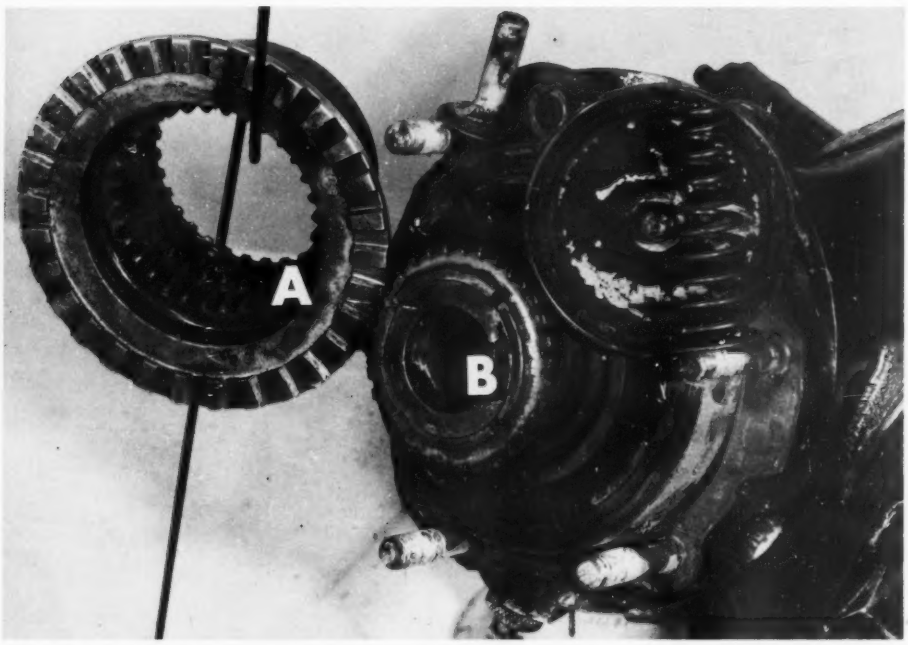
The circumstances under which power deterioration may occur during salt water operation vary with a number of factors, the most significant of which are wind velocity and hover altitude as follows:

- The rate of salt buildup in the engines is greatest in winds of 8-12 knots. In this condition, there are white caps on the water and a moderately heavy salt spray is lifted off the water. The salt forms a relatively well defined torus about the aircraft, the forward portion of which is blown back to the immediate vicinity of engine inlets and windshield.
- At wind velocities of 15-20 knots and higher, salt spray is generated, but it is blown aft underneath the engines so that the rate of salt buildup is small.
- For a given wind condition, the rate of salt buildup varies in a nonlinear manner with hover altitude. At 30 feet there is generally no significant buildup regardless of wind condition. The change in rate of buildup is moderate down to 15 or 20 feet. As the altitude is lowered further, the rate of salt buildup increases. However, even at altitudes as low as 5 feet, the winds usually have to be in the range of 8-12 knots to cause a rapid deterioration of engine performance and stall margin due to salt spray. Caution: Take note of windshield spray deposits. The amount of salt water spray observed on the windshield is usually the best indication of the salt spray environment to which the engines are subjected. If the spray on the windshield is sufficient to require use of the windshield wipers, the engines are receiving a very significant amount of salt water. In this condition, deteriorating performance and reduction of stall margin is quite certain. Thus an increase in altitude is recommended. In the event that hovering is necessary in the above conditions, the best indication of performance and stall margin loss is the relationship between T5 and torque. A T5 increase of 30°-40° C for the same torque represents the maximum deterioration that can be accepted without complete loss of stall margin on those engines which have a marginal stator vane scheduling and/or compressor condition. Therefore, in a severe salt spray environment, the time for a deterioration of this magnitude may not exceed 3-4 minutes.

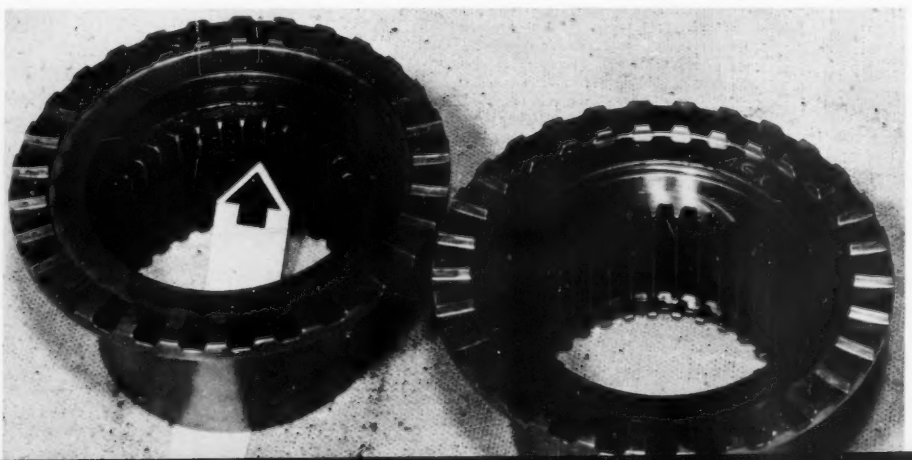
Warning: When the stall margin is entirely lost due to salt encrustation, relatively minor power reduction can cause the near simultaneous loss of power from both engines. In the event that maximum loss of stall margin is suspected, increase collective and commence a climbout, ensuring that the engines do not decelerate. Do not beep down or lower collective. Without reducing power, proceed to a point of intended landing. When the aircraft has been favorably positioned for an emergency landing, check the condition of each engine by beeping down individually to check for deceleration stall. Be prepared for engine deceleration stall.

Note: Continued engine operation in clean air may dissipate some of the salt buildup, but this cannot be assured. Flight through rain may also be beneficial in reducing salt buildup, thereby improving stall margin. Engines should be washed after each flight over salt water under 30 feet and daily at flights at 30 feet or above.

MARGINAL MAINTENANCE



Failure of 90° drive shaft coupling (A) was caused by lack of lubrication. Coupling was absolutely dry and void of grease. Lack of lubrication caused gear teeth on male spherical coupling (B) to grind out splines in rigid coupling



Failed coupling (arrow) shown with normal coupling for comparison of splined area

ACCIDENT NUMBER 1

UH-1H IP: ". . . We made our approach and the pilot came to a stop over the pad. I told him to move off the pad so we could clear it for the next aircraft. We had hovered about 10 yards or so when the aircraft started to turn right. I told him to straighten it out. By then we had turned about 20°-30°. It was just a slow turn — nothing violent at all. When he didn't straighten it out, I said 'I've got it.' I took it and realized I wasn't going to stop it either.

"It acted as if we had a tailwind and had just run out of left pedal. I figured this was no big problem. I'd just wait for it to come around and then stop it. I let it go through 270° and it was still just an easy turn. I then decided it was time to stop, so I gave it left pedal. As soon as I hit left pedal, the helicopter started to spin. I realized it was not a tailwind and that we had somehow lost our tail rotor. I figured it was time to put it on the ground. I attempted to autorotate but the turn was so violent I couldn't. I'm not sure where the aircraft settled or finally stopped . . ."

Investigation board: ". . . The aircraft struck the ground several times, once with the skids, once on the tail boom, and twice with the main rotor blades, before coming to rest. During the turn, the tail boom was broken off at station 270, allowing the main rotor to strike the tail rotor blades and hub and sever the vertical fin. Thirty-four inches of the white main rotor blade was severed and hurled 1,000 feet where it struck and damaged one main rotor blade of a parked UH-1D. There was no fire.

"*Analysis:* Investigation revealed the splines within the drive shaft coupling on the 90° gearbox input quill had failed. This failure caused complete loss of power to the 90° gearbox and resulted in antitorque failure. Failure of the drive shaft coupling was caused by a lack of lubrication. The coupling was absolutely dry and void of grease. Lack of lubrication caused the gear teeth on the male spherical coupling to grind out the splines in the rigid coupling.

"All other damage to the tail rotor assembly and drive shafting resulted from main rotor blade impact, ground impact, and associated overstresses and bending. Antitorque failure did occur and was the primary cause of the accident . . .

"The overall maintenance, forms, and records on this aircraft were excellent. There was every indication that maintenance was being performed on time and in accordance with directives. However, all available mechanical evidence indicated the drive shaft coupling failed from lack of lubrication and there was no evidence the grease had been thrown out of the coupling . . .

"The locally produced inspection checklist used by the maintenance personnel did not require an internal inspection of the couplings or a lubrication repack of the tail rotor drive shaft coupling on any 100-hour inspection. However, the 2404 inspection worksheet has an entry 'Repack all drive shaft flexible couplings.' The corrective action column indicated

the couplings were repacked and signed off by the tech inspector. If this coupling had been packed at 510 hours, airframe time, it is most unlikely the coupling would have been dry 72 hours later with no sign of grease being thrown out through the seal. The other couplings were full of grease.

"The board concluded this failed coupling had not been serviced at the fifth PE. Further, the tech inspector who signed off this item of the inspection must not have seen the work accomplished or failed to inspect the finished work. He approved the entry as having been completed.

"The checklist omitted some items of maintenance required by TM 55-1520-210-20PMP Inspection Checklist. Further, it did not provide detailed guidance on how to perform 100-hour inspections. Because of a considerable turnover of maintenance personnel within the unit, the board believes the checklist should be modified to include more details . . .

"When the IP took control in the initial stages of the slow right turn, complete antitorque failure had not occurred, but was progressing. The IP's decision to let the aircraft continue the turn 'into the wind' before attempting to stop was based on his previous 'downwind, loaded ship' landing experience.

"In this instance, the wind was negligible and what wind there was should have assisted in stopping the turn. Further, this was not a heavy aircraft (7,455 pounds) and sufficient power was available as the density altitude was -1,500 feet and the aircraft was equipped with the -13 engine. The IP reacted as could be expected, based on his experience. He should have put the aircraft on the ground prior to complete loss of antitorque control. During his instructional and standardization training, emphasis was placed on maintaining directional control at all times, particularly while hovering . . . .

"*Recommendations:*

"1. Closer supervision of mechanics and tech inspectors.

"2. Thorough review of checklist to:

"a. Include more detailed guidance for mechanics and inspector personnel who perform maintenance.

"b. Identify items to be accomplished at 200, 300, or 500-hour levels."

ACCIDENT NUMBER 2

Witness: ". . . I saw a UH-1D traveling southeast approximately 300 feet above the ground and approximately 900 yards in front of me. All of a sudden, I saw two large pieces fly off its left rear and the aircraft started spinning very fast. It was spinning to the left and going down. When it hit the ground it exploded . . ."

Flight surgeon: ". . . The aircraft struck on its skids, flattening them, and rolled to its right, coming to rest upside down. It was either on fire when it struck or burst immediately into flames. The aircraft was destroyed by intense heat and fragments were scattered a good distance, indicating tremendous decelerative forces."

Note: Of seven occupants, only the pilot and one passenger escaped fatal injuries from the crash and fire.

Flight surgeon: "One passenger untangled himself from the wreck and crawled out, assisting the pilot from the wreckage. Both suffered severe burns . . . The pilot's hands were partially burned and his feet were severely burned.

"Due to decelerative forces, it is doubtful that any more passengers would have survived if no fire had been present . . .

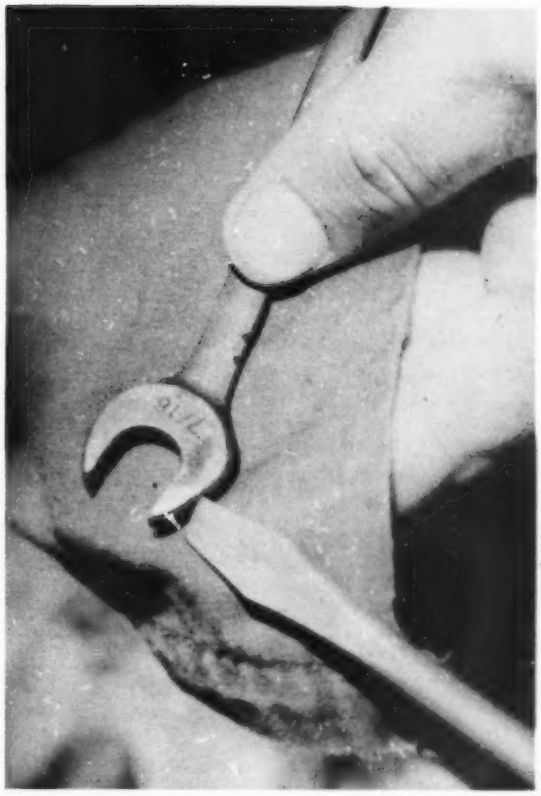
"The flight gloves worn by the pilot afforded good protection to his hands and the chest protector must have protected his chest anteriorly. However, he had the jungle type of combat boot on (leather, canvas, and nylon web construction), which probably contributed to his severely burned feet . . . The pilot's injuries once again point to the urgent need for fire retardant clothing for aviation personnel. The flight gloves protected his hands. The rest of his body was unprotected. The nylon-leather-cotton boot should not be worn by aviation personnel. Leather boots afford much better protection and should be standard for flying personnel."

Investigation: ". . . The portion of the aircraft found most distant from the wreckage was the tip portion of one tail rotor blade, found 308 meters from the crash site. From this point back to the crash site, portions of the vertical fin were found. The largest portion, with one tail rotor blade attached, and the 90° gearbox adjacent, was found 129 meters from the wreckage. The main rotor blade and hub assembly was located adjacent to the wreckage, with portions of the blades scattered within a circular pattern of 200 meters. The remainder of the wreckage was at the crash site . . . . "

Analysis: "The board concluded the jam nuts on the two bolts that hold the pitch change link crosshead backed off because they were undertorqued or had been reused . . .

"The crosshead assembly was found separated from the tail rotor assembly. The bolts, washers, and nuts

Screwdriver points to shiny area of wrench which rubbed against and caused tail rotor drive shaft to fail



for attaching the crosshead to the tail rotor slider were not found.

". . . The self-locking nuts backed off the bolts that hold the crosshead on to the tail rotor assembly, allowing the bolts to back out of the slider, which allowed the crosshead to swing free, causing loss of the tail rotor."

Note: TM 55-1520-210-20P and -35P, dated August 1967, specifies the use of the self-locking castellated nut (which requires a cotter pin), FSN 5310-961-8390, for UH-1 tail rotor slider retention.

ACCIDENT NUMBER 3

UH-1H pilot: ". . . The IP and I took off from the POL to do some autorotations. He gave me an autorotation and I turned downwind. I didn't have the collective all the way down. We started going down and I finally got the collective all the way down. When the IP got on the controls and started bringing in power, I think I heard a popping noise in the back. He pushed the left pedal in and said, 'I think we have a tail rotor failure.' We descended and then started turning. As we were turning, he tried to gain more airspeed to pull out . . . We didn't have enough airspeed and the aircraft started to spin violently . . .

"As the IP cut the throttle, the aircraft slowed up. When he started pulling in collective again, it started spinning again and hit on the left skid, turning about 180°, and slamming over on the left side."

Investigating officer: "The tail rotor drive shaft was sheared. Both tail rotor blades were free from dents, the 90° gearbox was full of oil, and there were no rotational marks on the ground from the tail rotor, indicating the tail rotor blades were not turning at impact . . .

"The center tail rotor drive shaft access panel was removed and a $\frac{3}{8}$"-$\frac{7}{16}$" open end wrench was found in the tail boom below the damaged area. Worn and shiny areas were found on both ends. The two sections of the damaged drive shaft were removed and a portion of the damaged area was sheared or cut. One tail rotor drive shaft weight was severed. The fastener receptacle adjacent to the damaged drive shaft was damaged. It was concluded that the wrench contacted the tail rotor drive shaft and caused damage that resulted in shaft failure . . . ."

ACCIDENT NUMBER 4

UH-1D aircraft commander: ". . . I saw we were approaching the two LZs in reverse order to which we had been briefed. The advisor on my aircraft was shouting to go across the river and not to land on the south side. By this time, suppression had started, and when I looked up from making a last minute check on my map, I saw the pilot was going around. I felt sure the C&C and gunships that had laid the marks were right and the advisor wrong. But he insisted it was not the right LZ. I told the pilot to go ahead and land.

"Because of the suppression fire, we had trouble hearing each other. We were very low as we started another approach. I saw we were overshooting and took control to go around. We were less than 50 feet as I pushed the cyclic forward and increased collective. We were not in translation and the aircraft continued going down. The rpm began to unwind. I flared to try to regain rpm and slow the descent.

"I knew we could not avoid a crash and leveled the aircraft. It touched down in an almost level position with the right front skid tilted slightly right and forward. As the aircraft sank in, forward momentum caused it to flip. The tail boom came over the fuselage and the aircraft came to rest 180° from the direction we had been flying.

"We landed in a canal that was 4-7 feet deep, with

the tail boom in the shallow end. I could not remove my chest protector, so I unbuckled my seat belt and crawled out through the front windshield into water which was over my head, with my chest protector on. I managed to grab the aircraft and release the chest protector about the same time. I counted the crew and they were all out of the wreckage . . .

"Shortly after I started the go-around, I saw the rpm was dropping rapidly. I got no response at all when I applied power. Because of the suppression fire, I did not hear any unusual noise from the aircraft or engine. However, I firmly believe I had a loss of power because of the rapid drop in rpm."

Maintenance sergeant: "A pilot came up and asked me to look at his aircraft. He said he had a power loss going into an LZ and the rpm dropped to around 4000-4400. He had a moderately hard landing and then the rpm came back to normal.

"I went to the aircraft and assisted the crewchief. We removed the barrier filters and a quarter section of the engine inlet screen and inspected the stator vanes and blades for damage. The crewchief told me that when the engine slowed down, he looked back and saw excessive black smoke coming from the exhaust. I checked the droop cam and throttle control linkage, and then the bleed air band. I told the crewchief to take a fuel sample and drain the sumps. We found no evidence of water or trash.

"The pilot said the rpm came back to 6600 after the hard landing and he had flown the aircraft out. He said it acted normally. When the flight cranked, he checked the engine instruments and said that everything appeared to be all right. He then flew for the rest of the day, approximately 5½ hours, with no trouble.

"At the end of the day, he wrote up the power loss and moderately hard landing. I took the 2408-13 to the maintenance office where I discussed the write-up

a red diagonal, instead of a red X, was used to indicate the status of the aircraft . . .

16. STATUS SYMBOL	17. FAULTS AND/OR REMARKS	18. ACTION TAKEN	19. SIGNATURE
	Flt #1 A severe, but momentary loss of power was experienced on a normal CA landing. Engine seemed to die with RPM falling to 4000 after touchdown. Pitch was lowered and engine slowly caught on again and full power was regained. Black smoke was noticed spewing from exhaust on landing and engine icing light was on. All other instruments were in the green.	Carried Forward	
	Moderately hard landing as a result.	Carried Forward	

with a technical inspector, an engine man, and the night maintenance officer. I told the crewchief to drain the fuel samples in the morning before starting, which he did. The aircraft then flew approximately 1½ hours before crashing."

Appointing authority: ". . . This accident is a glaring example of a preventable accident which was allowed to happen because of errors and faulty procedures throughout the operational and maintenance chain of command.

"The first error was committed by the crewman who signed off flight number 1, DA Form 2408-13, dated the day before the accident. The write-up obviously described an occurrence of sufficient magnitude to be of major importance to the platoon leader, section leader, and maintenance personnel available during operations. A write-up of this nature requires immediate command and maintenance action which was not carried out to the extent required. The mere fact that the aircraft continued to fly the remainder of the day without a recurrence of engine malfunction was pure good fortune.

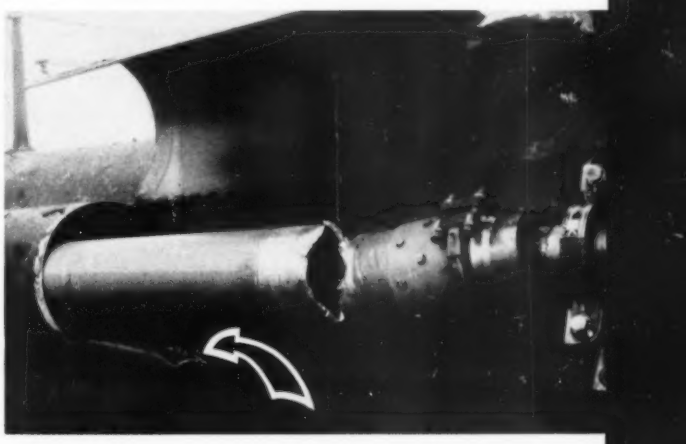
"The second and more grievous error was in maintenance, both technical and administrative. The use of a red diagonal in place of a red X to indicate the status of this aircraft makes improper checking of entries in the maintenance chain of command obvious. Proper checking of entries and symbols to assure correct matching of severity of defects to the correct symbol was not carried out as it should have been by the more experienced supervisory personnel. The complete lack of any indication of corrective action taken and numerous errors on the forms indicated a complete breakdown of organization in the maintenance area. It appeared from statements made by maintenance personnel that the original problem — the drastic loss of operating rpm — was disregarded. Through faulty logic and procedures, corrective action was terminated with the fuel system. At a minimum, it would seem that a functional test flight and topping check should have been made to find out why the engine performed as it did.

"It is difficult to understand how a crew with the experience of this aircraft commander and pilot would accept an aircraft with the defect described on DA Form 2408-13. The failure to attach proper significance to the write-up could only be the result of not inspecting the log, or substandard alertness . . .."

ACCIDENT NUMBER 5

A UH-1H was on a medical evacuation mission. On board were the crew, four patients, and two pas-

IN A RECENT SIMILAR ACCIDENT . . .



a torque wrench box left in a tail rotor drive shaft tunnel rubbed against the shaft and caused it to fail. And the list goes on. When a UH-1D had tail rotor failure, the airspeed dropped to approximately 40 knots and the helicopter went into a spin, crashed, and burned. The cause of failure was a ball peen hammer left at station 370. The hammer rubbed against the tail rotor drive shaft and caused it to fail

the only cure for this type of accident is a complete tool inventory after every job

sengers. En route to destination, the aircraft commander (AC) was notified to pick up one more patient.

On short final, a loud crack, like a gunshot, was heard at 50 feet. The helicopter spun to the right and dropped into a nose low attitude. The AC and pilot realized they had antitorque failure and simultaneously closed the throttle to flight idle. Closing the throttle and the application of aft cyclic had little effect.

The UH-1 made three complete revolutions. At approximately 10 feet, the AC applied full collective and continued holding aft cyclic in an attempt to cushion the landing. The helicopter struck the ground, then rolled to the left. The main rotor blades hit the ground and the helicopter began to break up. The AC shut the engine down by turning off the main fuel valve.

Investigating officer: ". . . Inspection showed the tail rotor and 90° gearbox were missing from the immediate crash area . . . One tail rotor blade was found approximately 140 yards from initial impact. The blade grip was still attached to the blade and was properly safetied. Internal components of the grip, including the sleeve, grip bearings, and retaining nut, were in the grip. The blade end of the pitch change link was still attached to the grip, and appeared to have been forcibly snapped off from the crosshead end of the link. Ground marks where the tail rotor blade hit the ground were light, indicating the blade had floated, rather than slammed into the ground.

"The other tail rotor blade, with the remaining portions of the tail rotor hub attached to it, was located within 20 yards of several mating components . . .

"Inspection of parts contained within the grip of this tail rotor blade revealed that the bottom thread of the bearing retainer nut was stripped, indicating it had been forcibly separated from the threaded end of the yoke. The spring pins which are safety devices for the bearing retainer nut could not be found. Nor was there any indication they had been present when the nut stripped off . . .

"Teardown and inspection of the remainder of the tail rotor hub was accomplished by removing the blade and grip assembly . . . The safety pins were not present. The torque on the bearing retainer nut was approximately 200 inch pounds, instead of the required 300-800 inch pounds.

"Inspection of the output shaft of the gearbox showed the tail rotor mounting threads were completely stripped off, indicating the tail rotor nut had been properly installed and forcibly ripped or stripped from the shaft. The tail rotor pitch control rod was still in the gearbox. Location of components on the ground, stress bends on the vertical fin, and location of the pitch control chain on the left side of the vertical fin indicated the gearbox separated from the aircraft prior to impact.

". . . The spring pins were not installed between the bearing retainer nut and the yoke during reassembly of the yoke. This allowed the nut to lose torque and eventually strip from the threads on the yoke . . . Use of sonic test equipment allows inspection of yoke threads without removal of the bearing retainer nut. It does, however, require removal of the grip, thus exposing the nut. It is felt that a proper technical inspection of this area before reinstallation of the grip would have revealed that the safety devices were not installed."

Recommendations: "1. One-time inspection of all tail rotor yokes having more than 100 hours since new to ensure spring pins are properly installed.

"2. Stringent inspection requirements by all support units prior to installation of the grip on the yoke assembly to ensure that safety pins are properly installed."

Appointing authority: "The AC is commended on a job well done in averting what could very easily have been a fatal accident.

"The investigating officer is commended for a fine and thorough accident investigation, which resulted in the discovery of a maintenance error which could have resulted in other inflight failures . . . ."

. . . a proper technical inspection of the yoke area before reinstallation of the grip would have revealed that safety devices were not installed

WHY TEFLON HOSES FAIL

How good is TEFLON? It is the best material available for use as flexible fluid hoses

Ted Kontos

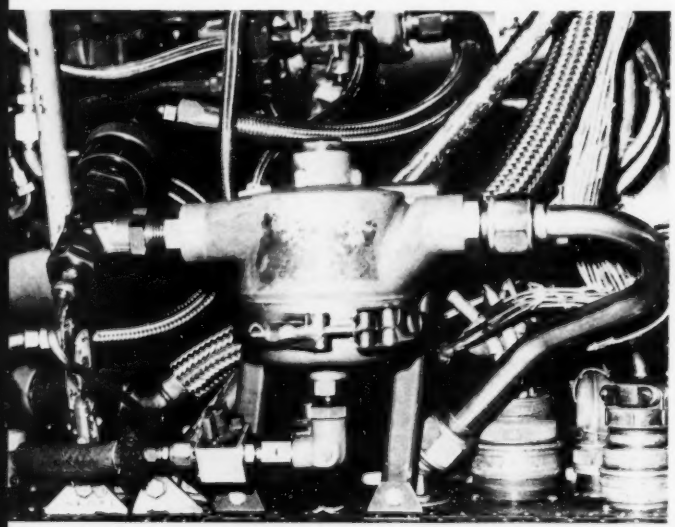
FOR MANY YEARS, aircraft got along fine with rubber hoses. They were used to carry fuel, oil, hydraulic fluid, water, alcohol, and any other fluid that needed transporting. They were used to couple metal lines and used where flexibility was needed. They served as high and low pressure carriers — and they got the job done. But rubber hoses had limitations. They weren't very effective at temperatures below -65° F or above 260° F, except for short-time service. They had a limited shelf life, requiring substantial inventories for replacements. Some fluids they carried caused them to deteriorate and some mechanics were prone to overtorque hose clamps, causing premature failures. Rubber hoses could not be reused.

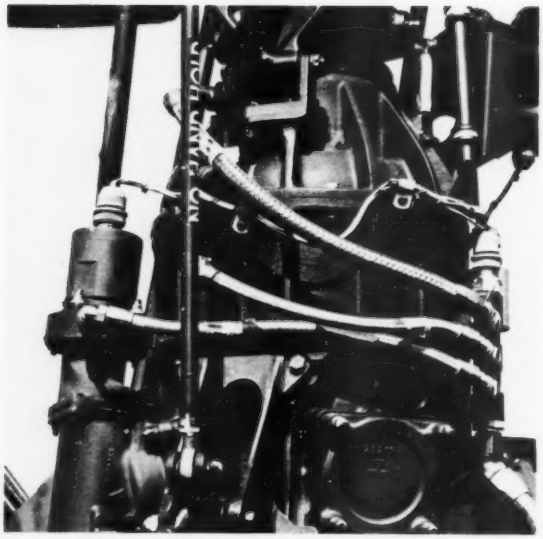
Then along came TEFLON. It was made into tubing, installed on aircraft and, today, TEFLON lines are rapidly replacing rubber hoses. Approximately 12 Army aircraft mishaps — incidents, forced landings, precautionary landings, and sometimes accidents — result from failures of the new lines each month. Are they really superior to rubber? Why do they fail?

TEFLON is Du Pont's trade name for tetrafluoroethylene resin. It has been used for aircraft hoses for about 13 years. It is tough, flexible, can function effectively within a temperature range of -100° F to 450° F, and, in special applications, above and below this range. It does not deteriorate with age. It is not

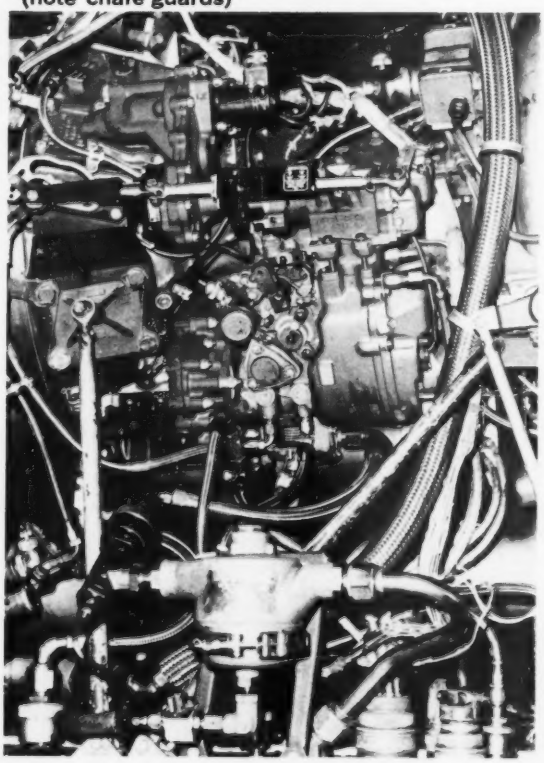
WHY TEFLON HOSES FAIL

When inspecting lines, remember to check security of quick disconnect couplings





Lines should be of correct length and installed without sharp bends or twists (note chafe guards)



Kinking occurs more easily in larger sizes and in very short assemblies. Never stand on TEFLON hoses

Increased use of TEFLON lines in major aircraft systems demands expert care

chemically affected by fluids and undamaged hoses can be reused.

Each step in the construction of a TEFLON hose has an important purpose. The resin, a soft white powdery substance, is first mixed with additives and extruded into tubing form. During this process, the material is compacted uniformly, producing the hose, but it is not yet ready for use. It must be carefully inspected to ensure that compacting has been uniform and no hard spots which could cause failure exist. It must then be reinforced. Reinforcement is required to enable the hose to withstand the high pressures of fluids it will carry.

Reinforcement is usually accomplished by braiding the exterior of the hose with high-tensile stainless steel wire. If the hose is to carry a high pressure fluid, more than one layer of wire braid may be required. In some applications, a layer of TEFLON is interlayed between layers of wire braid. In others, reinforcement is accomplished by using layers of special wound wire instead of wire braid. To complete construction, fittings are installed and the hose tested.

Construction of TEFLON hoses varies. Lines which must carry fluid from a cool area to a hot one may be constructed in a combination of rigid and flexible hose assemblies. This provides necessary flexibility for routing and allows easy installation and removal. Because installations may require sharp bends, some hoses are preformed — set to desired shape — under heat and pressure. The service these lines will give depends on the care they received during storage, handling, installation, and maintenance.

STORAGE

During storage, dust caps should be installed over end fittings and hoses kept in areas free from dust and other contaminants. They should be stored loosely. If long lengths are coiled, the coil diameter should be ample to prevent kinking. Preformed hoses to be used in special applications may be shipped with tie wires securing each hose in its preformed shape. These wires should remain intact until the hose is ready to be used, to prevent twisting, straightening, or kinking.

Do not use cramped or confined storage areas. If long lengths of hose are coiled for storage, a liberal coil diameter must be provided

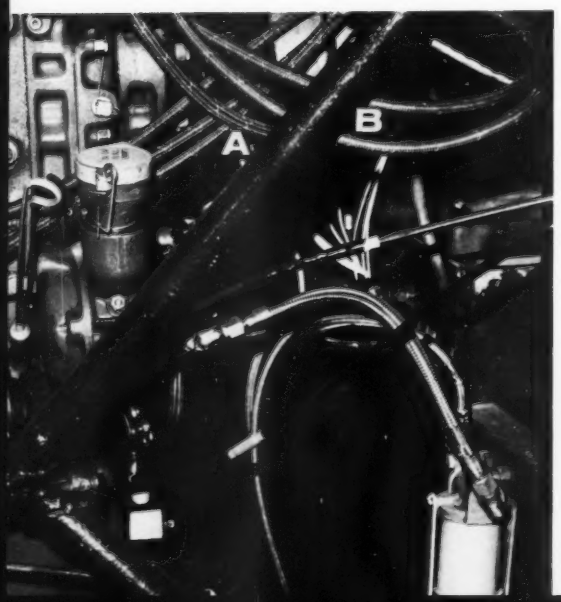
HANDLING

Excessive bending or twisting can weaken TEFLON hoses and cause premature failure. While it may not damage the TEFLON core, it will weaken the wire braid. When a bent or twisted line is placed under pressure, it will reshape to its original configuration, but the service life of the wire braid may have been substantially reduced.

Damage to the wire braid and premature failures can result from other causes, such as leaving hoses on floors or maintenance stands where they might be crushed or damaged.

INSTALLATION

Bend radii must be considered when installing TEFLON hoses. Bends should always be as generous as the installation will permit — a minimum of one and one-half times the diameter of the hose. All lines



Note discrepancies in this photo. TEFLON lines are chafing on each other (A) and on aircraft structure (B)

WHY TEFLON HOSES FAIL

should be installed with a slight bow or slack to allow expansion and contraction from pressure variations and temperature changes. It is essential that hose clamps be properly positioned along the length of the line to stand it off from adjacent components. This is to prevent chafing and assist in routing. Clamps should be tight enough to hold the line, but not tight enough to compress and restrict it.

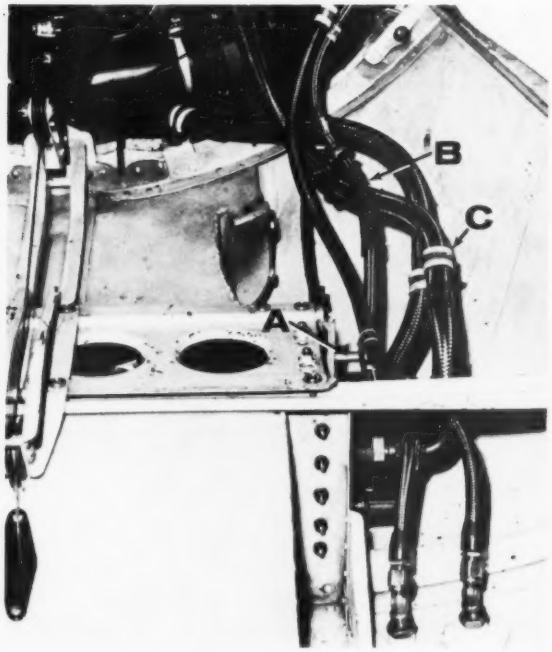
During installation, the hose should be first attached at the most inaccessible end of its routing and the fitting finger tightened, leaving the hose free to turn. The other end should be similarly attached, the hose positioned along its routing, and the required support clamps installed.

During routing, the hose should not be bent or forced in sharp angles. Changes in direction should be made by clamping the hose so that curves are gradual. Care should be taken to distribute the slack between the hose connections and clamps. Short lengths and hoses of large diameters are more easily kinked and require greater care during handling and installation.

Standoff clamps should not restrict travel or cause hoses to be placed under tension, torsion, compression, or shear stresses during flexing cycles. Hose fittings should always be torqued to correct values.

Ensuring that lines do not bend, twist, stretch, or get cut during movement of attached components is a must

Extra care should be taken when handling preformed hoses. Never attempt to straighten them



Standoff clamps (A), chafe guards (B), and bundling (C) are used to secure lines and prevent chafing while permitting flexibility

MAINTENANCE

TEFLON hose assemblies tend to take the permanent shape, or preform, to the installed position when used as hot fluid lines. When removing a hose, no attempt should be made to straighten it. Each hose should be allowed to retain its shape when removed or stored.

Chafe guards should be used to prevent damage to TEFLON hoses or to adjacent components. These may be tape, leather boots, vinyl, etc.

Installed hose assemblies should not be used as hand holds or pulls to position creepers under engines or airframes. Stresses from these practices can cause failure of hoses and fittings. When parts are removed with hoses still attached, the hoses should not be used as handles.

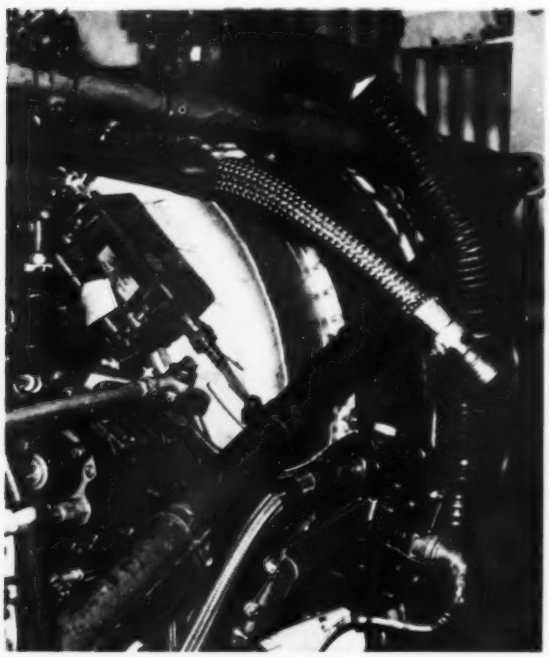
When serviceable TEFLON hoses are removed for any purpose, including overhaul, parts replacement, etc., they should be cleaned and carefully inspected. The physical condition of the outer wire braid should be carefully checked. If over half the wires in any grouping or plait are broken any place on the line, it should be replaced.

Stainless steel wire braid is normally a silvery color. After it is subjected to high temperatures during service, it turns a golden or light brown color. If a small area of the hose appears deeply discolored (dark brown or blue-black), it may be due to an extreme local hot spot near the line. The temperature in that area may have exceeded that recommended for the line and damaged it. If this type damage is found or suspected, the line should be replaced.

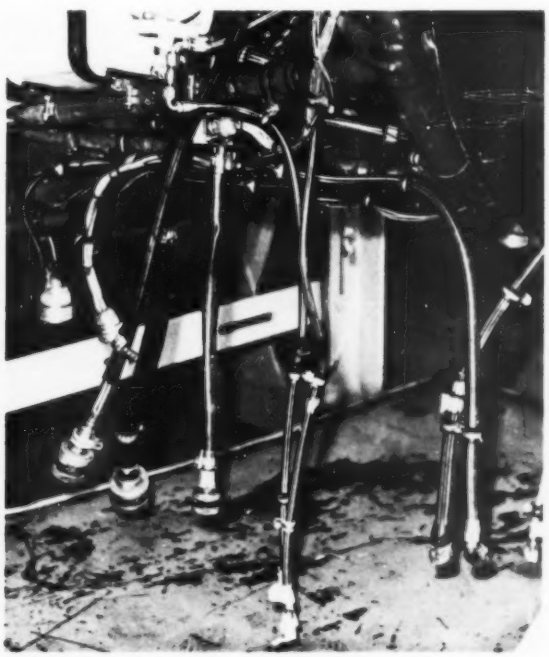
Different lines may be inspected internally by different methods. Short straight assemblies can be examined by looking through one end of the line while holding a low intensity light at the other. Long lengths, preformed lines, or lines with elbow fittings installed can be checked for obstructions by passing a small ball through the tube. NOTE: MAKE SURE THE BALL HAS BEEN REMOVED BEFORE INSTALLING OR STORING THE LINE.

All fittings should be carefully inspected. During overhaul, all hoses should be removed, cleaned, inspected, proof-tested, capped, and stored until needed.

How good is TEFLON? It is the best material available for use as flexible fluid hoses. Why do TEFLON hoses fail? In most instances, because they are improperly stored, handled, installed, and maintained. A good understanding of TEFLON hoses and proper care can eliminate these failures.



TEFLON lines combined with rigid tubes permit ease of installation and removal while providing desired flexibility



Disconnected lines should be capped or sealed with grease resistant paper, not tape as shown in this photo. Tape adhesive will dissolve and contaminate fluid systems.

pearls persona

equipment and rescue/survival lowdown

We're fortunate this month to have the personal account of an Army aviator who is a believer in the title of Army training film TF 46-3605. Our sincere thanks to MAJ James E. Richards, Department of Tactics, USAAVNS, who submitted the following article to the DIGEST

"DRESS TO LIVE" — YOU BETTER BELIEVE I WILL!

"DRESS TO LIVE" is the name of an Army safety film. It is also a meaningful phrase to me.

I was assigned to an airmobile company light in the land of rice paddies and Charlie and had numerous occasions to participate in combat assaults known by other names to those of you who have had this sometimes exciting experience.

Our mission for the day was to extract elements of an airborne brigade after a search and destroy operation and return them to their base camp. I was aircraft commander in the left seat.

The day was hot and the density altitude high, but this was not unusual. We left our door gunner, C rations, and all other extra gear at home. The plan of extraction called for lifting eight American troopers per slick. The first lift was uneventful. Little or no fire was received in the extraction, and the in-trail landing in the landing zone on the perimeter of the base camp was routine. I saw that the LZ had foxholes, some bunkers, and a few poles, but this was not too unusual. The LZ was narrow, dusty, and it ran slightly uphill, but again no real sweat. I might also mention the landing was accomplished with a 4-6 knot tailwind, but it was the best way in.

After completing the first lift, the company returned for the second lift. The aircraft was lighter because of fuel burned off from the first lift and takeoff was no problem. We flew a staggered trail en route and made a formation change to trail to prepare for landing. Our approach appeared completely normal until, at an altitude of approximately 40 feet and an airspeed of 30-40 knots, the pilot of my aircraft started to terminate. He had applied some pitch when I felt a sudden sinking. I immediately glanced at the engine and rotor tach and saw the engine going through 5800 and the rotor tach not far behind.

I took control at that point, froze the collective in its position, and looked for a place to put the aircraft. We were in number 7 position of the trail formation. Believe me, the condition of the LZ now looked worse than it had before! I managed to dissipate most of the groundspeed, leveled the skids, and pulled the remaining pitch before touchdown.

The application of pitch appeared to have little effect and we hit hard. The tail boom struck a bunker — finis one tail boom — and the helicopter moved forward, still not too bad until the right skid struck a trench. At this time, things became hectic. The

cyclic was wrenched from my grasp and the fool thing tried to beat me to death. We rocked forward and right, with rotor blades striking the ground, and the transmission breaking loose from its mounts. By this time the troopers had been thrown all over the LZ. No seats were available and they were sitting on the floor, not strapped in. Luckily, no one was killed and only one had other than minor injuries.

After the Huey settled in a heap and the dust started to subside, I got out through the hole where the left front windshield had been. The pilot went through the right front door. We were both loaded into a Dustoff and evacuated to the nearest hospital. Other than a few cuts on our faces and bruises all over, both the pilot and I were in pretty good shape. We flew again 3 days later.

I was wearing gloves, APH-5 helmet with visor down, combat boots, jungle fatigues with sleeves rolled down, flak vest, and armored chest protector.

The front and top of my helmet had deep scratches, and the right rear was crushed by a blow from a flying blunt object. The visor was down on impact and it shattered, but the cuts under my nose and on my lip were caused by my face making contact with my armored chest protector. I retained my helmet throughout the crash sequence. It was properly fitted and the chin strap was fastened and tight.

The back of my left glove was scratched and gouged and the palm was cut on my right glove, but I did not have a scratch on either hand. My left combat boot had a deep cut 4 inches long and ankle high. My ankle was not marked, but I did get a good bruise in that area.

According to our flight surgeon, that blow on the helmet could have crushed my skull — I'm hard headed too! There is no doubt that my boots and gloves also saved me from more serious injury.

The pilot also retained his properly fitted helmet and was wearing gloves and boots. The right side of his helmet was broken from ground contact when the aircraft rolled right and then came back upright.

This is not a pleasant day in my memory, but I suffered no serious injury, and I survived the crash.

"Dress to Live"— you better believe I will! I'm a believer and I hope that some of you skeptics will be after reading about my experience.

OTHER SIDE OF THE COIN

The other side of this coin comes from the flight surgeon's analysis in a recent UH-1D accident report: "The helicopter had just picked up six troops and climbed to an estimated height of 100-300 feet when the engine failed. The ship cleared a clump of trees and landed in a rice paddy, hitting the tail boom on a dike. It then slid across the rice paddy and

This occupant from a recent helicopter accident wore his gloves throughout the flight, but removed them to gather his papers and gear while the helicopter was hovering in after landing. That's when the accident and fire happened. This picture shows the results

If you have a question about personal equipment or rescue and survival gear, write Pearl, U. S. Army Board for Aviation Accident Research, Fort Rucker, Alabama 36360

struck the dike on the other side.

"Upon impact, at least four of the passengers were thrown clear of the wreckage. Two other persons were pinned under the wreckage and had to be extricated.

"The aircraft commander, *who habitually did not strap his flight helmet,* was apparently killed instantly by a posterior occipital head injury. His helmet came off during the crash. All other occupants survived."

Our thanks to LTC Henry H. Tomme, chief, Aviation Safety Division, USARV, for these items from the USARV Weekly Summary:

CLEANING OF ARMOR VESTS
(FLAK JACKET)

Due to the high consumption of body armor by personnel in this theater, it is believed that considerable savings in supply effort and cost can be achieved through improved individual care of body armor. The instructions outlined below will aid in reaching this goal.

A. *Hand Washing Method*

1. Remove laces from vest for better cleaning.
2. Remove loose soil from vest using a cloth or soft brush.
3. Apply a soap or detergent solution to the soiled areas, brushing vigorously to wet and loosen the soil.
4. Rinse with warm water.
5. Repeat application of soap or detergent to remove stubborn stains.
6. Rinse with clear water.
7. Air dry vest away from open fire or hot stove.
8. Clean the laces in the soap or detergent solution, dry, and replace in vest.

B. *Shower Bath Method*

1. Remove loose soil from vest using a cloth or soft brush.
2. Remove clothing and put on vest.
3. Wet vest in shower or stream. Apply cake soap to soiled areas on front of vest. Rub vigorously to work up a lather, then rinse in shower or stream.
4. Put vest on backwards and repeat the above cleaning procedures.
5. Turn vest inside out and clean as above.
6. Air dry vest away from open fire or hot stove.

C. *Precautionary Measures*

Any vests which show evidence of punctures of the vinyl envelope encasing the ballistic filler should be turned in as salvage. Do not use any dry cleaning solvents, gasoline, or similar products because they will stiffen the vest and reduce its protection.

SURVIVAL RADIO PROCEDURE

The following standardized procedure for the use of the RT-10 radio by downed aircrews has been implemented by 7th USAF SAR. This procedure is published as a guide for Army aviators and crews.

As direct result of 3 ABR Gp study of downed aircrewmen's use of RT-10 survival radios in SEA, requirement for standardized procedure became evident. *In order to optimize electronic search phase of SAR effort,* following instructions will be adopted as standard procedure and immediately briefed to all aircrewmen.

a. Turn off personal locator beacon; if possible, remove beacon from parachute and stow in pocket of survival vest or flight clothing.

b. Attempt voice contact via RT-10 radio; if voice contact not immediately established, institute beacon tone/listen cycle.

c. Beacon tone/listen cycle: 1. Transmit tone for 15 seconds. 2. Transmit call sign. 3. Listen in receive for 15 seconds. Repeat sequence until voice contact is established.

d. When voice contact is established, survivor will follow directions from aircraft making contact.

e. If ground environment conditions are permissive, personal locator beacon may be used to provide tone with listening watch maintained on RT-10 radio in order to conserve battery life.

USAASO Sez

The U. S. Army Aeronautical Service Office discusses

use of comment card

designation of Army air traffic controllers

ON COMM CARDS: We have had USAASO comment cards (COMM CARDS) in the inventory for a long time, but their acceptance, judging from our mail, is something less than overwhelming. There may be a misconception as to their purpose. COMM CARDS are not only to comment on flight information publications or to submit corrections as we did with the old "Cap'n Sharp" cards, but also to give you a quick and easy way to let us know what is on your mind. If you have a gripe, suggestion, request, comment or other idea on any aspect of Army aeronautical services, grab your operations officer by the arm, ask him for a COMM CARD and jot down your thoughts. Unless we hear from you, we assume all the world is "A-OK" on aeronautical services.

On equipment shortcomings: Don't like some of your ATC equipment? What's wrong with it? The Equipment Improvement Report (EIR) is the official means for reporting deficiencies in equipment performance and design. Take a look at TM 38-750, Army Equipment Record Procedures, paragraph 3-7.4. In most cases, EIRs are sent to USAECOM for ATC equipment. We'd like a copy, too.

How about fixes which don't involve unsatisfactory performance? Improving equipment performance and capabilities is only part of the action. The ease with which ATC equipment can be used to do the job can greatly improve air traffic controller performance. USAASO needs your ideas on this kind of equipment improvement. Drop us a line. (COMM CARD, anyone? Address: Flight Facilities Division, USAASO, Cameron Station, Alexandria, Va. 22314.)

On air traffic controllers: On 1 January 1969 all Army air traffic controllers will be designated as special category personnel. What this means is that special personnel management procedures will be initiated to ensure that the personnel resources of this career field are efficiently used. These procedures will provide positive identification of all personnel trained and assigned in air traffic controller MOS. Detailed individual records will be maintained on each soldier in this career field. Closely controlled assignments of these personnel will be made, based on verified requisitions received from major Army commanders. Student input for training for this MOS will also be monitored as a part of these procedures.

Details of the implementation of the ATC special category handling will be published in the near future.

COL Hugh Gaddis and one of the first H-13Bs at the Army Aviation Museum

Army Rotary Wing School Birthday

THE FIRST DAY of this month marks the 20th anniversary of Army rotary wing training. While the day finds larger and highly refined aircraft entering the inventory, updated versions of the Army's first helicopters (the H-13 series) are still used, many quite effectively in combat.

On 1 November 1948 Captain (now Colonel) Hubert D. Gaddis flight standardized the first Army rotary wing instructor pilots and organized the Army's first helicopter flight training course.

Gaddis attended the first helicopter flight class instruction at Buffalo, N. Y., in the new YR-13 (H-13).

In 1947 the Army had a formal agreement with the Army Air Corps to train Army students in primary rotary wing flying at San Marcos, Texas. It was anticipated that Army students would train along with Air Force personnel, but the Air Force conducted a separate trainer for the Army in YR-13s. Pilots were being graduated after only 25 hours of instruction.

The Army did not feel this to be adequate. Consequently, it established the Army Helicopter Advanced Tactical Training Course at Fort Sill, Okla.

Members of Gaddis' initial IP course were Lieutenants Rodney J. Collins, Norman Goodwin and Marcus Sullivan, and civilians James K. Knox (deceased) and Charles L. Martin (currently with the U. S. Army Aviation Test Board at Fort Rucker).

The Army obtained its first helicopters in 1946 with an initial inventory of 13 Bell YR-13s. The Sikorsky H-19 and Hiller H-23 were added during the Korean War.

FAIR SKIES OR FOUL . . .

the U. S. Army Board for Aviation Accident Research welcomes your inquiries and ideas on all aviation safety subjects.
*Address:
Director
USABAAR
Fort Rucker, Alabama 36360

*Direct communication authorized by AR 15-76